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Report of Activities, 2002 Resident Geologist Program

Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Districts, Mines and Minerals Information Centre and Petroleum Resources Centre

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ONTARIO GEOLOGICAL SURVEY

Open File Report 6115

Report of Activities, 2002
Resident Geologist Program

Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Districts, Mines and Minerals Information Centre and Petroleum Resources Centre

by

P.J. Sangster, W.J. McGuinty, V.C. Papertzian, K.G. Steele, C.R. Lee, M. Barua, D.A. Laidlaw and T.R. Carter

2003

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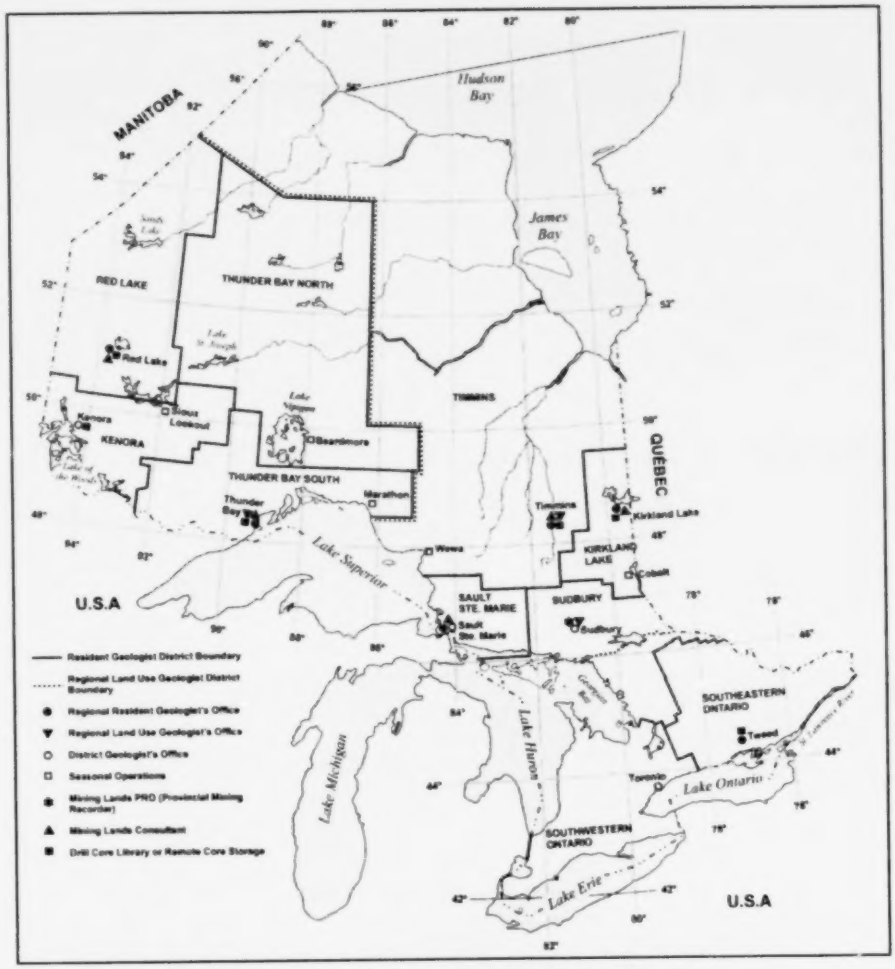

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Ontario Geological Survey
Resident Geologist Program
Report of Activities—2002

SOUTHERN ONTARIO
REGIONAL RESIDENT GEOLOGIST REPORT

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Ontario

Ontario Geological Survey
Resident Geologist Program

Southern Ontario Regional Resident Geologist
(Southeast Ontario District)—2002

by

P.J. Sangster, V.C. Papertzian and D.A. Laidlaw

2003

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SOUTHERN ONTARIO REGIONAL RESIDENT GEOLOGIST (SOUTHEAST ONTARIO DISTRICT)--2002

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INTRODUCTION

In 2002, production from mines and quarries continued throughout the District within the Grenville Province and in the Paleozoic rocks to the south and to the east. Junior mining companies and independent prospectors completed exploration programs for various commodities including diamonds, dimension stone, gold, graphite, platinum group elements, vermiculite, wollastonite and tantalum/niobium. Lydia Diamond Exploration of Canada Ltd. released the results of independent sampling and analyses that confirmed the discovery of multiple diamonds. Re-evaluation of a copper-nickel prospect originally discovered in 1961 resulted in the publication of a new resource figure totaling almost 11 million tons. Advanced exploration and development of 2 vermiculite prospects led to positive production decisions.

MINING ACTIVITY

During 2002, there were 46 mineral extraction operations in southeastern Ontario, including 6 industrial mineral operations, 2 trap rock producers, 3 cement producer's quarries, 1 brick producer's quarry, 3 gemstone and mineral specimen sites and 25 stone quarries. For a complete listing of mining activity and locations of operating mines and mills in southeastern Ontario, please refer to Table 1 and Figure 1, respectively.

Nepheline Syenite—Unimin Canada Ltd.

Nepheline syenite is a light-coloured, silica-deficient feldspathic rock composed primarily of sodium and potassium feldspars and nepheline. Added to glass and ceramics, nepheline syenite provides alkalis that act as a flux to lower the melting temperature of the glass or ceramic mixture prompting faster melting and fuel savings. In glass, nepheline also provides alumina which increases resistance to scratching and chemical durability and also improves thermal endurance.

Although nepheline syenite is relatively common it is produced in only 3 countries, Canada, Norway and Russia. To be of economic interest a body of nepheline syenite must have very low iron content: 2% or less heavy minerals. Deposits that meet this specification and are also in proximity to markets are not common. Commercial sources are limited to the Unimin Blue Mountain operations in Methuen Township near Peterborough and a smaller Unimin operation in Norway (Harburn 1996).

In 1999, the last year for which figures are available, Blue Mountain output was 650 000 t. At current production rates, there is sufficient resource for over 50 years production. Projected to 2001, an estimated 70% of the production went into glass, 15% was used in ceramic applications and another 15% in pigments and fillers. An estimated 60% of the output was exported to the United States, 20% was shipped to European markets and 20% remained in Canada (USGS 2002).

Unimin has announced plans to expand production capacity for micronized nepheline syenite used in architectural and industrial coatings applications. The expansion at the company's Nephton and Blue Mountain processing plants will increase capacity by 30% and is scheduled to go into operation in the first quarter of 2003. The initial phase of the expansion will be an upgrade to the plant's classification systems and is scheduled for completion in early 2003. The second and major phase will entail the installation of new milling capacity at Nephton. The investment is in response to demand from the coatings industry for the company's low free-silica "Minex" products. Unimin produces micronized nepheline syenite in several grades, with an average particle size of between 2 and 11 microns. In addition to paints and coatings, these products are used as functional fillers in plastics. Although filler applications are a value-added market for nepheline syenite, the high volume end uses are the glass and ceramics industries (*Paint and Coatings Industry*, January 2003; *Industrial Specialties News*, January 2003).

Table 1. Mining activity in 2002—Southern Ontario Regional Resident Geologist (Southeast). (Keyed to Figure 1.)

No.	Company/Individual (Mine Name)	Township (Commodity)	Mining Activity
1.	3 M Canada Inc. (Havelock Quarry)	Belmont (Trap Rock)	In 2001, 3M announced the planned closure of the Havelock site. Although there is a reserve of 50 000 000 tons onsite, 3M has 5 sister plants in the US and has decided to consolidate and confine operations to within the US. The onsite colouring plant was demolished in September 2002. The remaining plant and quarry are for sale. (3M Canada Inc., Feb. 2002.) Production ceased August 2002.
2.	AECON (formerly Armbro Construction)	Marmora (Limestone)	Limestone is quarried from former Marmoraton minesite for aggregate.
3.	Allan Franks Construction Ltd.	Madoc (Limestone)	Limestone has been quarried and crushed since 1991 for road aggregate.
4.	Amsen Quarries Ltd.	Harvey (Limestone)	Limestone landscaping stone products.
5.	Aqua Rose Quarries	Lyndoch (Gemstones, Mineral Specimens)	Quarrying operations for rose quartz, beryl, feldspar, lyndochite, amazonite, cleavlandite, peristerite, columbite, fluorite and bertrandite. Two quarries are in operation: the Beryl Pit which charges a fee for mineral collecting, and the Rose Quartz Quarry, which produces landscape stone.
6.	Arriscraft Corporation (Elgin Quarry)	Bastard (Sandstone)	Potsdam sandstone was quarried for the manufacture of reconstituted sandstone. Raw material was shipped to Cambridge for processing. In 1998, a new application was found, with blocks being quarried and cut into tiles for lining acid tanks.
7.	Bancroft Chamber of Commerce (Bear Lake Diggings)	Monmouth (Mineral Specimens)	Fee for collecting site near Wilberforce.
8.	Belmont Rose Granite Corp. (Belmont Rose Granite Quarry)	Belmont (Dimension Stone)	Granite is quarried for dimension stone, curbstone, landscaping stone, crushed decorative stone and exposed aggregate.
9.	Canada Brick (Russell Quarry)	Russell, Gloucester (Clay Products)	Clay bricks are produced from red shale. During 2000, 74 883 t of material were extracted. The quarry is located in Russell Tp. The brick plant, in Gloucester Tp. produced 42 million brick units.
10.	Canada Talc Division , Highwood Resources Ltd. (Henderson Mine)	Huntingdon (Talc, Dolomite)	Highwood Resources Ltd. purchased Canada Talc in 1999. Highwood has invested considerable time and capital into upgrading and expanding facilities at both the mine and the processing plant. Additional access to ore has been attained by the development of a new mining level (underground) at the Madoc Mine which will allow for the planned increase in production to over 20 000 t per year. Similarly, the completed upgrading and expansion of processing lines at the Marmora processing plant has allowed for the increased volume of ground and micronized talc and dolomite products as well as the processing of other mineral filler products, principally barite.

No.	Company/Individual (Mine Name)	Township (Commodity)	Mining Activity
11.	Central Ontario Natural Stone (Batty Quarry)	Laxton (Limestone)	Grey, buff and black limestone is produced as flagstone.
12.	Cornwall Gravel Company Ltd. (Cornwall Quarry)	Cornwall (Limestone)	Limestone for dimension stone is quarried on demand from the thick upper beds of this construction aggregate quarry. (Cornwall Black marble).
13.	Danford Construction (Springbrook Road Quarry)	Huntingdon (Limestone)	Limestone is quarried and crushed for road aggregate (seasonal operation).
14.	Drain Construction	Dummer (Limestone)	Limestone for use as road aggregate.
15.	Drain Construction	Methuen (Granite)	Crushed stone for aggregate.
16.	Elite Blue Granite	Chandos (Marble)	Stone is split / guillotined for flagging and landscape stone.
17.	Essroc Canada Inc. (Picton Quarry)	Sophiasburg (Cement)	A cement plant and on-site limestone quarry with an annual production of slightly less than 1 000 000 tons. This is one of the largest cement plants in North America.
18.	Granimar Quarries Ltd.	Rear of Leeds and Lansdowne (Granite)	No production from site in 2002. In September 2002, BDO Dunwoody Limited, Receiver and Manager of Granimar Quarries Ltd., published inventory on site of approximately 100 m^3 of Light Rideau Red Granite and approximately 900 m^3 of Dark Rideau Red Granite.
19.	Haliburton Stone Works	McClintock, Laxton (Granite and Limestone)	A variety of granite and limestone dimensional and landscape stone are produced from 2 quarries.
20.	I.K.O. Industries Ltd. (I.K.O. Quarry)	Madoc (Trap Rock)	Since 1991, I.K.O. Industries Ltd. has operated a traprock quarry east of Madoc on the south side of Hwy 7. The quarry is located within a ridge of grey to black, fine-grained, agglomeratic, metavolcanic rock. The rock is durable and exhibits no undesirable weathering effects. An on-site mill and colouring plant produce roofing granules, which are trucked to the company's asphalt shingle manufacturing plant in Brampton. In addition to roofing granules, stone from the quarry is crushed to produce HL-1 aggregate (asphalt road surfacing mix). The quarry is licensed under the Aggregate Resources Act to produce up to 1 million t per year. A total of 70 people are currently employed at the quarry, mill and colouring plant. (OGS MP 161; I.K.O. Industries Ltd., February 2002.)
21.	International Quartz Ltd.	McClintock (Quartz)	Crushed white quartz is produced on demand for local market.
22.	Jeff Parnell Contracting Limited	Galway (Limestone, Granite)	Natural and dimension cut armour stone, rockery stone, garden stone, natural surface steps and natural and dimensional flagstone. Burgandy coloured granite from the site is being tested for decorative stone, landscaping and dimension stone applications.
23.	John Bacher Construction Limited	McClintock (Granite Gneiss)	Building stone, flagging stone, and landscaping stone.
24.	LaFarge Canada Inc. (Bath Quarry)	Ernestown (Cement)	A cement plant and on-site limestone quarry with a capacity to produce 1 million t of cement. Silica used in the production of cement is extracted from the company's Potsdam sandstone quarry in Pittsburgh Tp. as well as from recycled foundry sands.
25.	Nelson Windover Quarries (Windover, Buckhorn Quarry)	Harvey (Limestone)	Grey limestone is quarried as a seasonal operation for the production of flagstone.

No.	Company/Individual (Mine Name)	Township (Commodity)	Mining Activity
26.	North Hastings Aggregate Ltd.	Dungannon (Decorative Aggregate)	Multicoloured granite is extracted for use as decorative aggregate. 15 000 tons were shipped in 1999.
27.	OMYA (Canada) Inc. (Tatlock Quarry)	Darling (Calcite)	Calcitic marble is mined to produce high-purity, fine-grind calcite for fillers, with terrazzo chips and landscaping stone as secondary products. Annual production is 250 000 tons and quarry reserves currently stand at over 5 000 000 tons. In 2000, a 5-year expansion program was completed at their quarry and plant located in Perth.
28.	Payne, E.W. (Payne Quarry)	Dummer (Limestone)	Flagstone is produced seasonally from this quarry.
29.	Preston, Larry	Galway (Granite)	Burgandy-coloured granite is quarried for use as crushed stone aggregate and decorative stone.
30.	Princess Sodalite Mine	Dungannon (Soldalite)	Decorative stone, landscaping stone, mineral specimens including fee for collecting.
31.	Redstone Quarries	Galway, Harvey, Cavendish (Limestone, Sandstone)	Beige limestone and red sandstone are quarried for weathered landscaping stone and armour stone blocks.
32.	Rideauview Contracts Ltd. (Ellisville Quarry)	Rear Leeds and Lansdowne (Sandstone)	Sandstone produced for flagstone, granite blocks and masonry stone.
33.	Rideauview Contracts Ltd. (Pettworth & Renaud Quarries)	Camden (Limestone)	Limestone was quarried for building restoration work in Kingston.
34.	Rideauview Contracts Ltd. (Rideauview Quarry)	Storrington (Sandstone)	Red sandstone is produced for ashlar and flagstone.
35.	Rideauview Contracts Ltd. (Sloan Quarry, Battersea Quarry)	Storrington (Sandstone, Granite)	Cream and red sandstone are quarried for the production of ashlar, flagstone and landscaping stone at the Sloan Quarry. Red granite is quarried at the Battersea Quarry.
36.	Royel Paving	Galway (Granite)	Granite is quarried and crushed onsite for road aggregate.
37.	Senator Stone	Elzevir (Marble)	The quarry began production in 2001. White calcitic marble is quarried seasonally and crushed onsite.
38.	Senator Stone	Faraday (Marble)	The quarry site was brought to mining lease in 2002. (Temagami Pink marble breccia.)
39.	St. Lawrence Cement Inc. (Ogden Point Quarry)	Cramahe (Limestone, Cement)	The quarry has been in production since 1959. It produces between 1.9 to 2.1 million t of limestone per year. Crushed stone from the quarry is shipped by lake to the company's cement plant in Mississauga. The quarry employs 20 people.
40.	Stone Cottage Inn Ltd. (Attia Quarries)	Harvey (Limestone)	Grey limestone is quarried for dimension stone.
41.	Timminco Ltd. (Timminco Metals Quarry)	Ross (Magnesium, Strontium and Calcium Metal)	Magnesium is produced from high-purity dolomite mined at this location. Calcium and strontium are produced from purchased limestone. Production rate is 1000 tons of dolomite weekly. The annual production is 6000 tons of magnesium metal and alloys; 400 tons of calcium metal and alloys and 135 tons of strontium metal. The operation employs 240 people and there are reserves for 50 years at the current rates of production.

No.	Company/Individual (Mine Name)	Township (Commodity)	Mining Activity
42.	TRT Aggregates Ltd.	Ameliasburgh, Hilliard, Tyendinaga, Thurlow and Richmond (Limestone)	Rough dimension stone blocks, armour stone, flagstone and crushed limestone are produced. Most of the quarries are operated on an as-needed basis.
43.	Unimin Canada Ltd. (Blue Mountain Quarry)	Methuen (Nepheline Syenite)	Nepheline syenite is mined from a quarry and processed in 2 mills. Magnetite is produced as a by-product. Production rate is 2 500 tons per day. The mine opened in 1955 and employs 152 people.
44.	Upper Canada Stone Co. Ltd. (Mephisto Lake quarry)	Cashel (Calcitic Marble)	White marble is quarried and sold as crushed marble, landscaping stone, decorative stone and in pre-cast architectural concrete and panels.
45.	Upper Canada Stone Co. Ltd. Upper Canada Minerals Inc	Madoc and Huntingdon (Marble)	Red, pink, white, green, buff, black, blue, chocolate, light buff and light green marble are mined from 8 quarries in the Madoc area. Marble chips (terrazzo), exposed aggregate and landscape stone are produced at the mill. In 2001, Upper Canada Stone acquired operations of Specialty Aggregate - Madoc plant and quarries.
46.	Upper Canada Stone Co. Ltd. Upper Canada Minerals Inc	Rear of Leeds and Landsdowne (Granite)	Red granite is quarried for armour stone, landscaping, architectural and structural stone from both quarries. (Kingston Red Granite Co. Ltd. (Seeley's Bay Quarry #1 and Seeley's Bay Quarry #2.)

ADVANCED EXPLORATION AND DEVELOPMENT

Vermiculite—Galway and Cavendish Townships

The first discovery of vermiculite in the Galway–Cavendish area was made in 1950 near Catchacoma Lake. Exploration by Globex Minerals Inc., 1973–74, and Goshawk Mines Limited, 1975–77, identified a potentially economic resource. In the late 1990s, exploration to the west of highway 507 identified a more extensive, higher grade vermiculite deposit. Three companies are currently actively exploring the new deposit. Regis Resources and Canadian Vermiculite have each announced production decisions on their respective properties. The third company, Blue Marble Mining Corporation, is at an earlier stage in the exploration of its unpatented mining claims but reports that the results of work to date have been positive and further exploration is planned for 2003. (McKinnon et al. 1990; Blue Marble Mining Corp., personal communications, 2002.)

REGIS RESOURCES VERMICULITE—CAVENDISH TOWNSHIP

A summary of previous work on the Regis Resources Cavendish Township vermiculite deposit is given in the 1998, 1999, 2000 and 2001 Report of Activities, Southern Ontario Regional Resident Geologist (Southeast District). In 2002, with permitting under the Aggregate Resources Act in place, construction was completed of an on-site facility where an unexfoliated vermiculite concentrate will be produced. Response from custom testing of a 40 ton bulk sample has been good. No asbestos has been detected in the vermiculite and the company plans to be in production by March 2003. (S. Shefski, Regis Resources Ltd., personal communication, February 2003.)

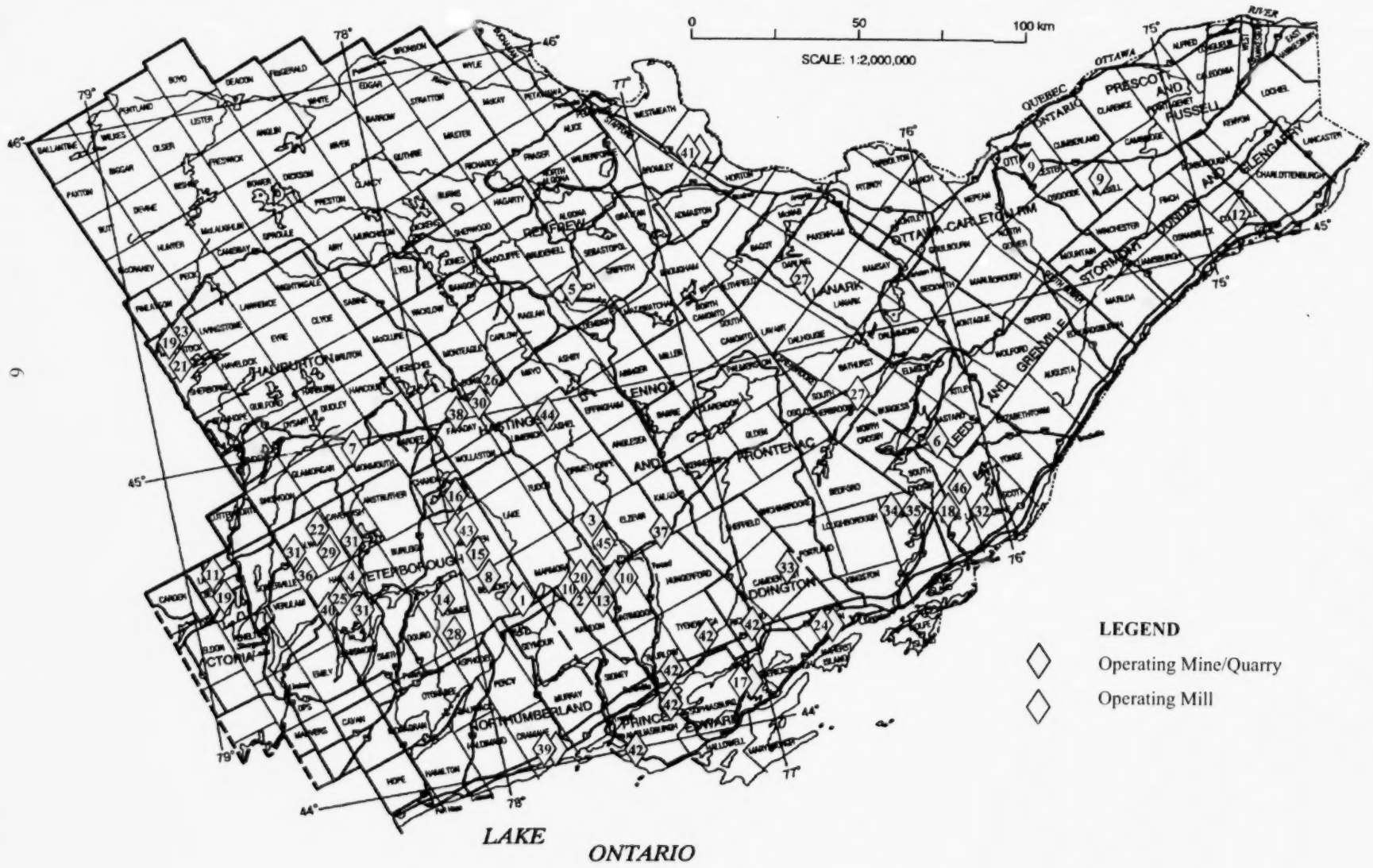


Figure 1: Mining/Quarrying Activity in 2002 - Southeast District, Southern Ontario Regional Resident Geologist

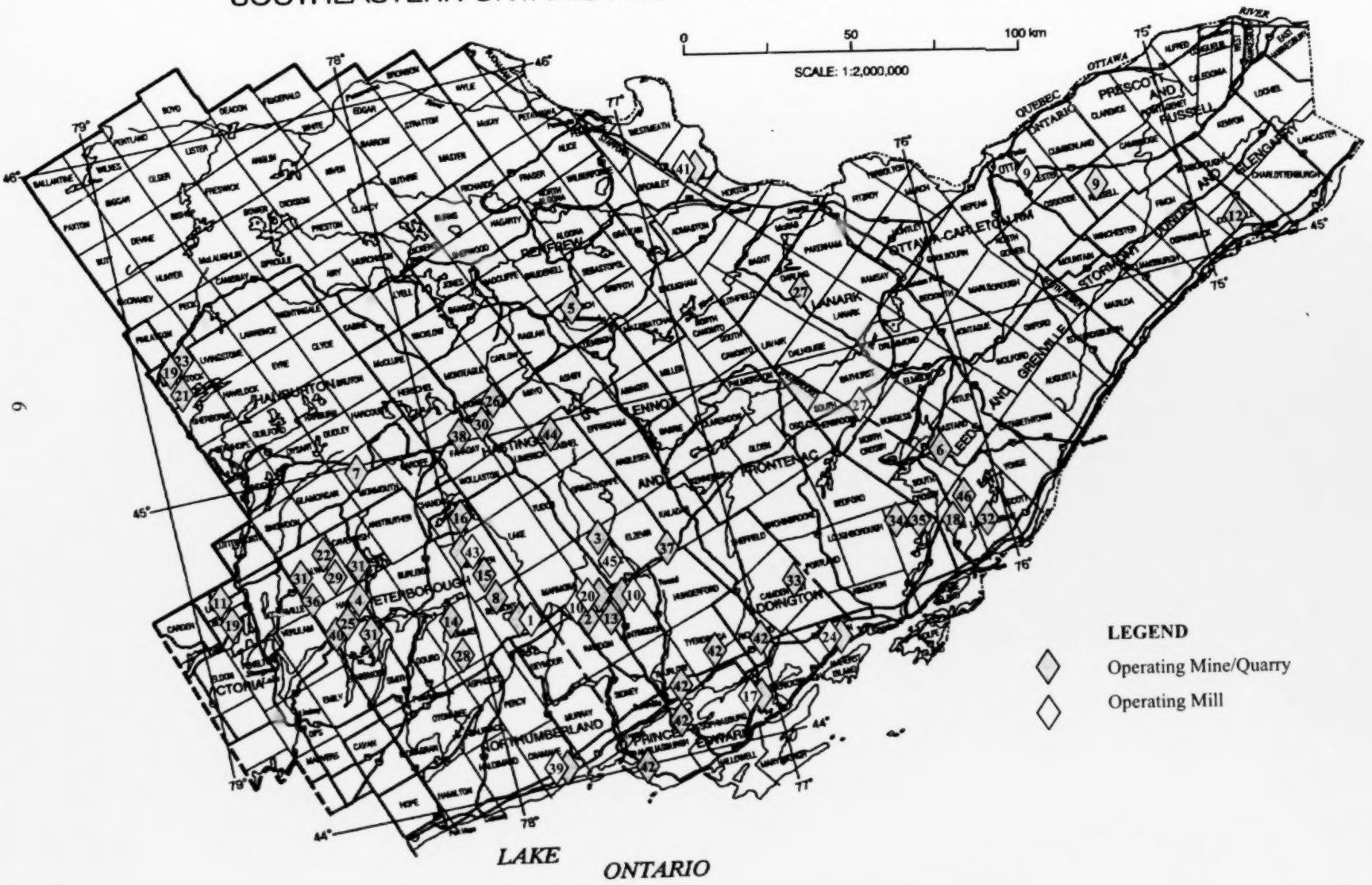


Figure 1: Mining/Quarrying Activity in 2002 - Southeast District, Southern Ontario Regional Resident Geologist

VERMICULITE CORPORATION OF CANADA INC.—GALWAY TOWNSHIP

Details of previous exploration by Vermiculite Corporation of Canada Inc. are given in the 2001 Report of Activities, Southern Ontario Regional Resident Geologist (Southeast District). The company holds unpatented mining claims in Galway and Cavendish townships totaling over 4000 hectares and has acquired rights to an additional 311ha of patented land. Analysis of bulk sampling from the deposit showed no fibrous asbestos minerals. Metallurgical testing by the Ontario Research Foundation found no gangue or hazardous minerals associated with the vermiculite. Further tests by Lakefield Research found no asbestos. The company is currently in the process of obtaining the necessary Official Plan and Bylaw amendments and hopes to be in production in 2003. Planned extraction would initially be to a depth of 37 feet with 20 000t of fine-grained vermiculite produced in the first year. (Vermiculite Canada, personal communications, 2002; The Lakefield Herald, January 2003.)

Canadian Wollastonite, St. Lawrence Wollastonite Deposit—Pittsburgh Township

Canadian Wollastonite continued evaluation of the St. Lawrence Wollastonite deposit in Pittsburgh Township. The company is currently working to have appropriate municipal zoning in place. Various surveys and scientific studies of the property, including hydrology, hydrogeology, environmental impact, natural environmental overview and assessment, noise and traffic studies and a botanical overview were successfully completed in 2002.

Previous evaluation of the deposit by U.S. Borax identified a mineral resource calculated to be 9.6 million t with an average grade of 38.1% wollastonite. Of that total, 5.1 million t has been confirmed with a high degree of confidence (measured, indicated and drill inferred reserves) with an average block reserve grade of 41.3%. The remaining 4.5 million t was calculated through geologic inference based predominantly on surface outcrop. A grade of 34.5% assigned to the inferred reserves is based on the overall average grade of both wollastonite and adjacent calc-silicate zones.

The deposit has an additional 3.7 million t of calc-silicate ore independent of the wollastonite skarn reserves. Diopside is a potential co-product. The following description of the deposit has been supplied by Canadian Wollastonite (Canadian Wollastonite website, 2002):

> The Saint Lawrence Wollastonite deposit occurs within a horseshoe shaped band of quartzite open to the east. The deposit is composed of calc-silicate and silicate skarn layers interbanded and strongly folded within the enveloping quartzite. The southern boundary of the skarn is in thermal metamorphic contact with a gabbroic intrusive which has a syenitic and late pyroxenite phase. The entire package has undergone granulite facies metamorphism. Wollastonite skarn formation is limited to the inner portion of a southwest plunging fold which closes to the west. The Wollastonite skarn zones present within this inner fold cover an area of 275 acres, of which 120 are included in the St. Lawrence deposit property. Wollastonite skarn (ca. 9.6 Mt) with an average wollastonite content of 41.3% is observed in bands averaging 12 meters folded repeatedly throughout the property. The average mineral content consistently associated with the wollastonite is: diopside/hedenbergite 40%, feldspar (predominantly albite with relatively minor microcline) 10%, quartz 5%, calcite trace <2%, sulfides (pyrrhotite and pyrite) <1% and garnet, graphite, phlogopite trace <1%. The wollastonite skarn typically grades into a calc-silicate skarn with a wollastonite content of >20% and <35% wollastonite. The decrease in wollastonite is generally accounted for by an increase in feldspar content.

(Canadian Wollastonite, personal communications, 2002.)

Palu–Corbelli Corporation Granite Deposit—Sheffield Township

Results of a bulk-sampling program completed on the Palu–Corbelli Corporation granite dimension stone prospect in Sheffield Township in 2000 were very positive. The company's original application for permitting under the Aggregate Resources Act to bring the quarry into production was rejected by the Ministry of Natural Resources (MNR). In 2001, the company completed a second application for permitting and also completed additional environmental and natural heritage studies as requested by MNR. Results of the studies confirmed that the proposed activity did not constitute a threat. In 2002, MNR denied the second application but gave the proponent the opportunity to apply for a third time. Completion of this application is underway. The property is situated on

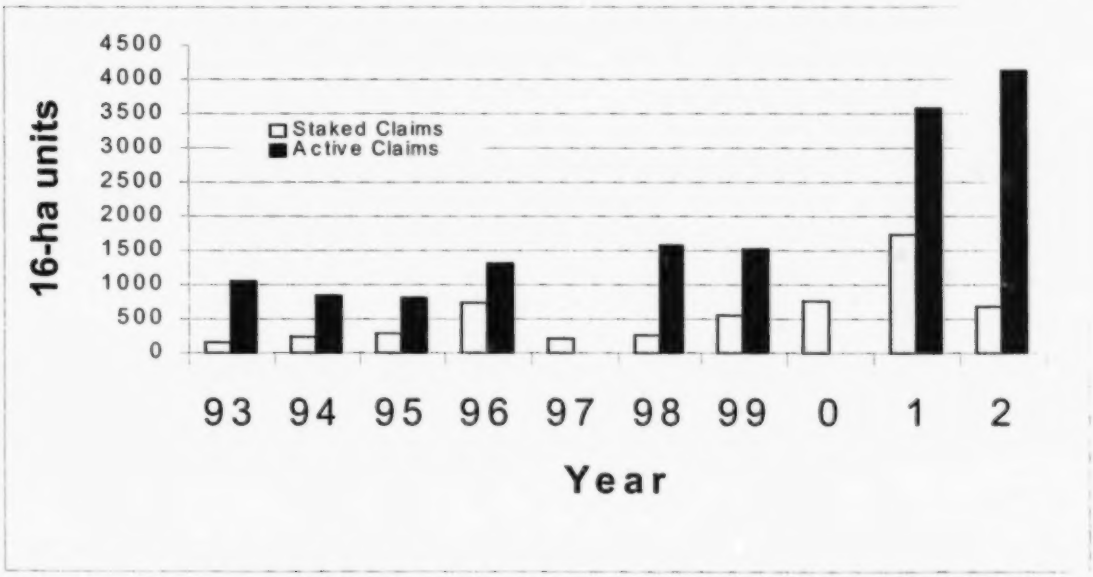
unpatented mining claims surrounded by an *Ontario's Living Legacy* proposed conservation reserve. (J. Palu, Palu Corbelli Corporation, personal communication, 2002, 2003)

EXPLORATION ACTIVITY

Lydia Diamond Exploration of Canada Ltd.—Wolf Lake Property

Lydia Diamond Exploration of Canada Ltd. continued exploration of unpatented mining claims in Tudor, Grimsthorpe, Cashel and Effingham townships. The exploration program has established multiple facies overburden stratigraphy recording late glacial, stagnant ice and highly localized flow conditions across the area with widespread meltwater ponding North of the Wolf Lake spillway. Strongly established patterns of Kimberlite Indicator Minerals, including grains with Diamond Inclusion Field affinity, and consistently high recovery of heavy minerals from till samples (>200 g of –1.0 mm, sg >3.1), resulted from an intensive sampling program. In September, Lydia announced that 2 promising targets had been identified by a till sampling program. Diamond drilling and additional trenching were completed on the P24 Target, a circular magnetic anomaly, and the Wild Dog area of the property where approximately 7 circular anomalies have been identified. The company further announced in September the intersection of a micaceous dike on Concession III, Lot 8, Tudor Township. The dike had been intersected and exposed by trenching and till sampling completed during the 2002 summer field program. In November, the company announced the discovery of 7 diamonds from independent sampling of the MJ-35 dike. The largest diamond had dimensions of 0.63 by 0.46 by 0.32 mm. To date, the company has reported that 19 clear, white and coloured diamonds have been recovered from the property. (Lydia Diamond Exploration of Canada Ltd., Annual Report 2001, press releases 2002; personal communications, 2003.)

Table 2. Claims recorded and active claims 1993 to 2002—Southern Ontario Regional Resident Geologist (Southeast).



Limerick Nickel-Copper Deposit

The Limerick nickel-copper property is situated in Limerick Township, 25 km south of Bancroft and 1 km west of Highway 62. The deposit was originally discovered in 1961 by the Bicroft Division of Macassa Mines during the investigation of magnetic anomalies identified by government airborne magnetic surveys. Diamond drilling by Macassa of the main anomaly in 1962 defined a resource of 1 800 000 t grading 0.92% nickel and 0.22% copper.

From 1969 to 1971 Lac Minerals completed an additional 70 holes in this zone (now called the north zone) and a new south zone. At that time, resource calculation of the north zone provided a drilling-indicated resource of 3 700 000 t grading 0.57% nickel and 0.17% copper to a depth of 300 m. No additional work is known to have been completed.

The 1969 diamond drilling identified a second zone, the south zone, located 1200 m south of the original discovery. The south zone has an indicated resource of 4 600 000 t grading 0.17% nickel and 0.07% copper to a depth of 75 m. To date the 2 zones have been investigated with 93 drill holes. Much of this material can be mined by open pit methods. The widths suggest that low cost, underground bulk mining may be applicable for the remainder of the deposit. The core from the 70 holes completed during the 1969–71 drilling program is available complete with drill logs, detailed assays and surveyed hole collar location information.

The mineralization occurs in ultramafic rocks of the Thanet Complex as massive and disseminated sulphide mineralization. Pyrrhotite, chalcopyrite and pentlandite make up the bulk of the sulphides. From diamond drill hole data, the mineralization occurs within fine- and coarse-grained pyroxenitic rocks in proximity to Van Sickle quartzites; both rock types are found in most of the drill holes. It appears that the mineralization and host rocks have been folded. The present interpretation classifies this mineralization as being volcanogenic massive sulphide (VMS) deposits in ultramafic volcanic and associated rocks. The 2 mineralized zones represent a resource totaling almost 11 million tons with the potential to double this figure with additional drilling. (D. McBride, October 29, 2002.)

Table 3. Assessment files received in 2002—Southern Ontario Regional Resident Geologist (Southeast).

Abbreviations

AEM ..... Airborne electromagnetic survey
AM ..... Airborne magnetic survey
ARA ..... Airborne radiometric survey
Beep ..... Beep Mat survey
Bulk ..... Bulk sampling
DD ..... Diamond drilling
DDH ..... Diamond drill hole(s)
DGP ..... Down-hole geophysics
GC ..... Geochemical survey
GEM ..... Ground electromagnetic survey
GL ..... Geological Survey
GM ..... Ground magnetic survey
GRA ..... Ground radiometric survey
Grav ..... Gravity survey
HLEM ..... Horizontal loop electromagnetic survey
HM ..... Heavy mineral sampling
IM ..... Industrial mineral testing and marketing
IP ..... Induced polarization survey
Lc ..... Linecutting
Met ..... Metallurgical testing
OD ..... Overburden drilling
ODH ..... Overburden drill hole(s)
OMIP ..... Ontario Mineral Incentive Program
OPAP ..... Ontario Prospectors Assistance Program
PEM ..... Pulse electromagnetic survey
PGM ..... Platinum group metals
Pr ..... Prospecting
RES ..... Resistivity survey
Samp ..... Sampling (other than bulk)
Seismic ..... Seismic survey
SP ..... Self-potential survey
Str ..... Stripping
Tr ..... Trenching
UG ..... Underground exploration/development
VLEM ..... Vertical loop electromagnetic survey
VLFEM ..... Very low frequency electromagnetic survey

	Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
1.	Ashby (Marble)	Allen J. Dubblestein	2000	Bulk, Str	2.23540	16
2.	Butt (Graphite)	Vinecrest Management Services	2002	GEM, Phys	2.24105	4
3.	Cardiff (U)	Initiative Explorations Limited	1968	Geol, GRA		229
4.	Cavendish (Vermiculite)	Blue Marble Mining Corp.	2001	Tr, Samp	2.22825	121

	Township or Area	Company Name	Year	Type of Work	AFRO Number	Resident Geologist Office File Designation
5.	Cavendish (Vermiculite)	Regis Resources Ltd.	2001, 2002	Bulk	2.23831	122
6.	Galway (Limestone)	Jeff Parnell Contracting Ltd.	2001	Tr, Geol	2.22804	44
7.	Griffith (Dol. Marble)	Dacre Industrial Minerals Inc.	2000	Str, Geol	2.22198	23
8.	Grimsthorpe (Au)	Grenville Gold Corporation	2001	DD, Samp	2.24078	75
9.	Harvey (Granite)	Floyd Preston Limited	2002	IM	2.24146	15
10.	Harvey (Limestone)	946606 Ontario Ltd.	1998-2001	Pr, IM	2.23681	14
11.	Madoc (Trap Rock)	IKO Industries Ltd.	2002	DD	2.23676	150
12.	Madoc (Cu, Au)	Candor Ventures Corp.	2001	DD, Samp	2.22986	148
13.	Madoc (Cu, Au)	Candor Ventures Corp.	2002	IP, GM	2.23257	149
14.	McClintock (BM, PGM)	Randsburg International Gold Corp.	2001	Pr	2.22141	55
15.	McClintock (BM, PGM)	Randsburg International Gold Corp.	2001	DD	2.22201	56
16.	Methuen (Gabbro as Aggregate)	Trigan Resources Ltd.	2000	Bulk, IM	2.22242	41
17.	Methuen (Gabbro as Aggregate)	Trigan Resources Ltd.	2001	Pr, Samp, IM	2.22696	42
18.	Monmouth (Mineral Specimens)	Mark Bramham	2001	Pr	2.22384	154
19.	Monmouth (Mineral Specimens)	Bancroft and District Chamber of Commerce	2001, 2002	Geol	2.24577	155
20.	Monmouth (Mineral Specimens)	Mark Bramham	2001	Pr	2.24283	156
21.	North Burgess (Graphite)	Graphite Mountain Inc.	2000	DD	2.22853	22
22.	Olden (Wollastonite)	Wollasco Minerals Inc.	2002	Petrographic	2.24464	56
23.	Sebastopol (Mineral Specimens)	Don James Axford	2002	Tr	2.24030	6
24.	Sebastopol (Mineral Specimens)	Don James Axford	2000, 2001	Pr	2.24108	7
25.	Tudor (Diamonds)	Lydia Diamond Exploration of Canada Ltd.	2001	DD	2.23019	10
26.	Tudor (Diamonds)	Lydia Diamond Exploration of Canada Ltd.	2001	DD	2.22968	103
27.	Tudor (Diamonds)	Lydia Diamond Exploration of Canada Ltd.	2000	DD	2.23235	104
28.	Tudor (Diamonds)	Lydia Diamond Exploration of Canada Ltd.	2000	DD	2.22988	105
29.	Tudor (Diamonds)	Lydia Diamond Exploration of Canada Ltd.	2000	AEM, AM	2.22989	106
30.	Tudor (Diamonds)	Lydia Diamond Exploration of Canada Ltd.	2000	DD	2.23613	107

Table 4. Exploration activity in 2002—Southern Ontario Regional Resident Geologist (Southeast). (Keyed to Figure 2.)

Abbreviations

AEM ..... Airborne electromagnetic survey
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Beep ..... Beep Mat survey
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Samp ..... Sampling (other than bulk)
Seismic ..... Seismic survey
SP ..... Self-potential survey
Str ..... Stripping
Tr ..... Trenching
UG ..... Underground exploration/development
VLEM ..... Vertical loop electromagnetic survey
VLFEM ..... Very low frequency electromagnetic survey

No.	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
1.	946606 Ontario Limited	Harvey (Limestone)	Pr, IM
2.	Axford, D.J.	Sebastopol (Min. Spec.)	Pr, Tr
3.	Bancroft and District Chamber of Commerce	Monmouth (Min. Spec.)	Geol
4.	Bell, Z.	Hindon (Cu)	Pr, Samp
5.	Blue Marble	Galway, Cavendish (Vermiculite)	Pr
6.	Bramham, M.	Monmouth (Min. Spec.)	Pr
7.	Byer, J.	Elzevir (Trap Rock), Kaladar (Granite)	ARA Licence expansion ARA Licence
8.	Canadian Vermiculite	Galway (Vermiculite, Dim. Stone)	Samp, Analysis, DD
9.	Canadian Wollastonite	Pittsburgh (Wollastonite)	Pr
10.	Candor Ventures Corp.	Madoc (Cu, Au)	DD, Samp, IP, GM
11.	Champlain Marble	Hungerford (Dim. Stone)	Pr
12.	Chard, J.	Tudor (Au)	Pr
13.	Dacre Industrial	Griffith (Dim. Stone)	DD, Str
14.	Dupres, J.	Hungerford (Dim. Stone)	Pr
15.	Floyd Preston Limited	Harvey (Granite as Agg.)	IM
16.	Glanfield, M.	Barrie (Au)	Pr
17.	Gold Base	Kennebec (Au)	Str, Samp
18.	Grenville Gold Corporation	Grimsthorpe (Gold)	Pr

No.	Company/Individual (Occurrence Name) or Property	Township/Area (Commodity)	Exploration Activity
19.	IKO Industries Ltd.	Madoc (Trap Rock)	DD
20.	Johnston, M.	Galway (Limestone)	Pr
21.	Kriens, P.	Ashby (Dol. Marble)	Pr
22.	Lydia Diamond Exploration of Canada Ltd.	Tudor (Diamonds)	DD, HM, Samp
23.	McBride, D.	Limerick (BM)	Pr, Samp
24.	McGill, M.K.	Galway (Vermiculite)	Pr
25.	Norway Asphalt Limited	Methuen (Aggregate)	Samp
26.	Regis Resources Ltd.	Cavendish (Vermiculite)	Bulk
27.	Ross, D.R.	Cavendish (REE, Au, BM)	Pr, Samp
28.	Ross, R.	Tudor (Garnet)	Samp
29.	Skarn Co. Ltd.	Methuen, Dungannon, Olden (Dim. Stone)	Pr
30.	Vinecrest Management Services	Butt (Graphite)	GEM, Physical
31.	Wilkins, B.	Methuen (Au)	Pr, Claim Staking
32.	Wilson, M.	Camden (Soapstone)	Str
33.	Wollasco Minerals Inc.	Olden (Wollastonite)	Petrographic Study

LAND USE PLANNING ACTIVITY

For additional information on Land Use Planning Activity related to southeast District, please refer to the report of the 2002 Southern Ontario Regional Land Use Geologist (Open File Report 6116). D. Rowell is the Regional Land Use Geologist responsible for southern Ontario south of the French River and Manitoulin Island.

Ministry of Municipal Affairs and Housing

Through the Ministry's commitment to mineral-related Provincial Policy Statements contained within the Planning Act, the Resident Geologist Program (RGP) staff provide comment and input into the development of municipal Official Plans and Official Plan Amendments through the Ministry of Municipal Affairs and Housing's (MMAH) one-window approach. A summary of Tweed RGP Official Plan related activities is shown in Table 5.

Table 5. Municipal plans reviewed in 2002—Southern Ontario Regional Resident Geologist (Southeast).

County	Municipality	Plan Type
Frontenac	South Frontenac	Zoning By-law
Frontenac	Central Frontenac	OP
Frontenac	Tp. of Frontenac Islands	OP
Haliburton	Lutterworth	OP
Haliburton	Haliburton	OP
Haliburton	Haliburton	Draft OP Application
Hastings	Hastings County	OP

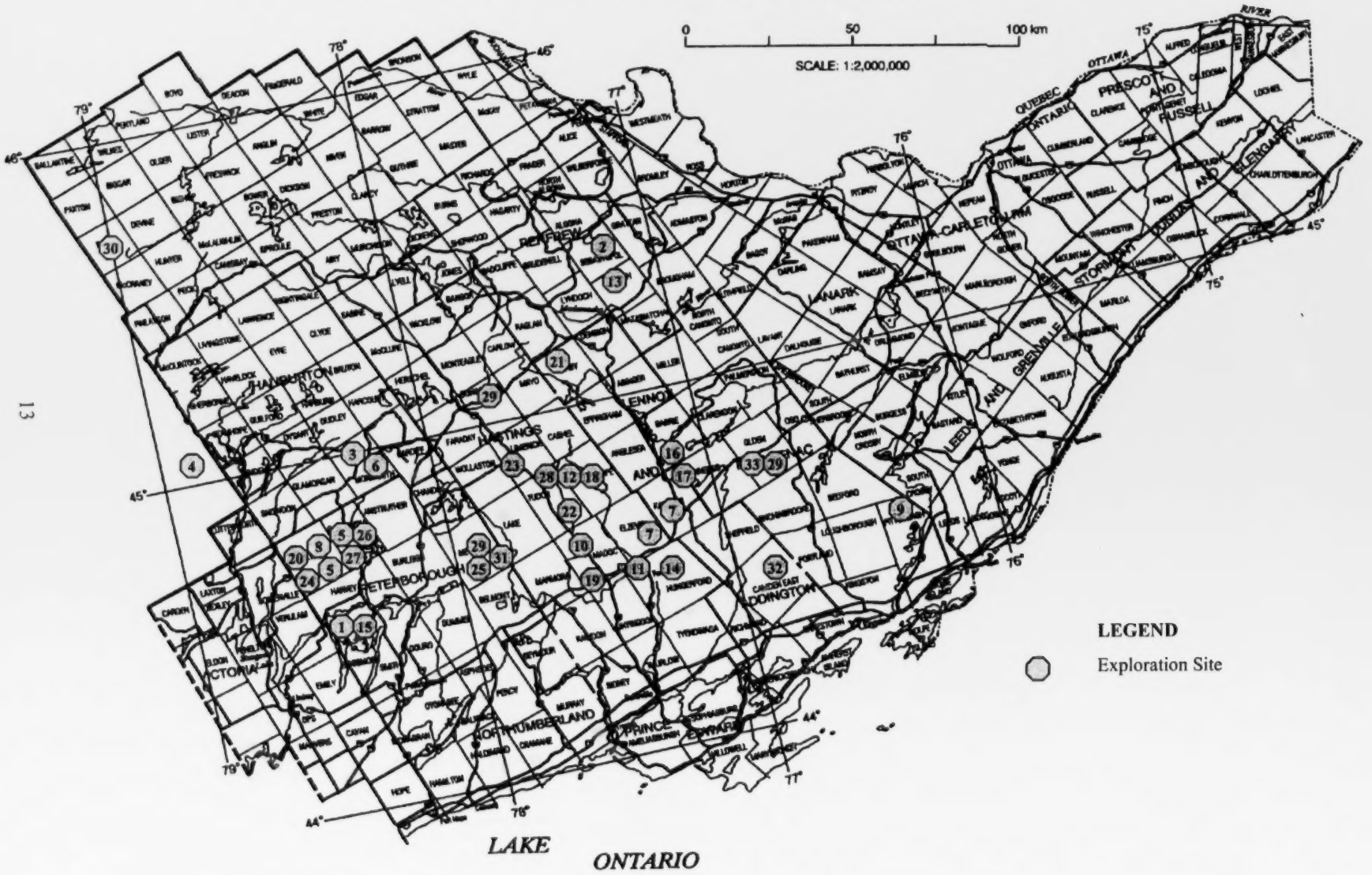

Figure 2: Exploration Activity in 2002 - Southeast District, Southern Ontario Regional Resident Geologist

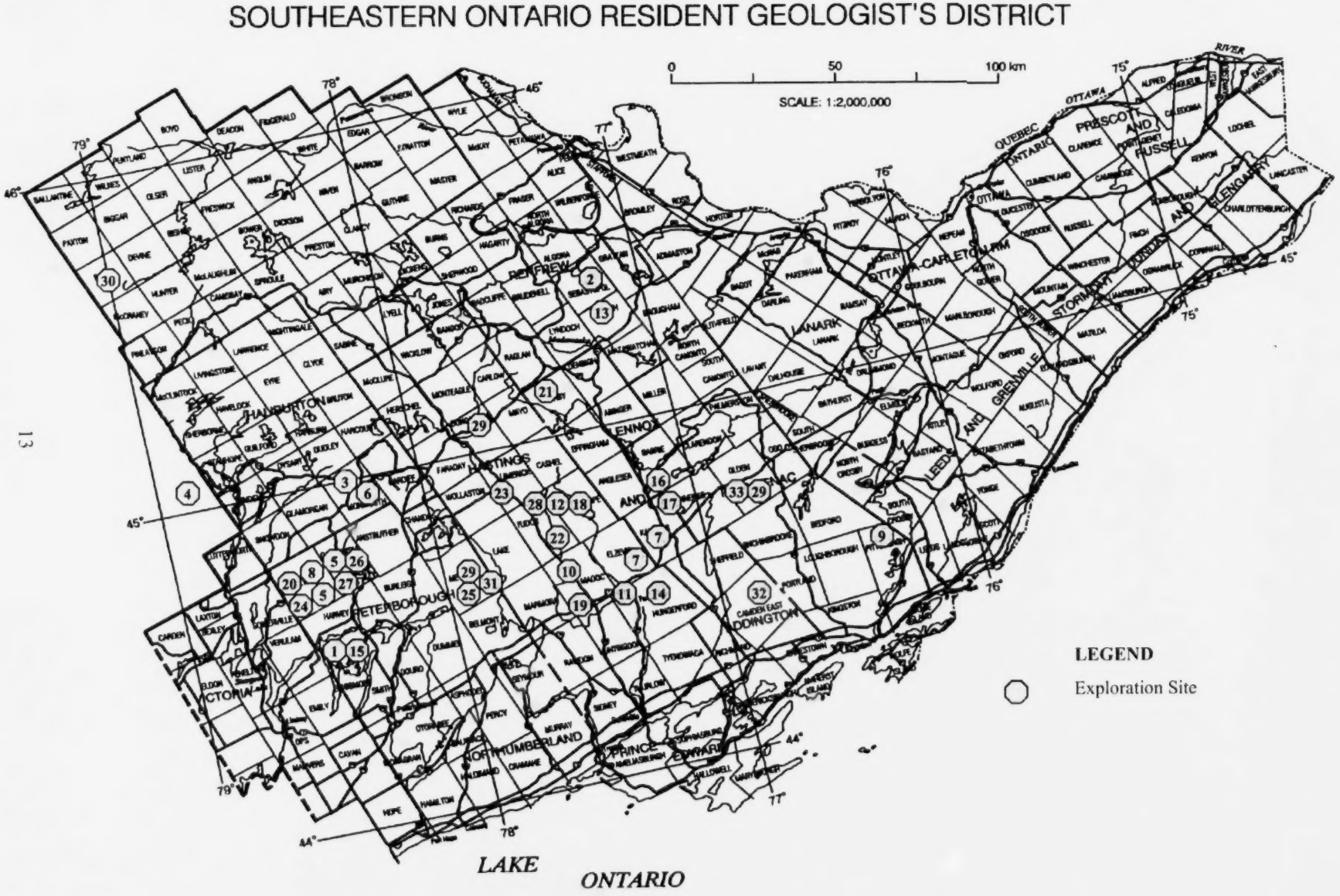

Figure 2: Exploration Activity in 2002 - Southeast District, Southern Ontario Regional Resident Geologist

Table 5. Cont'd.

County	Municipality	Plan Type
Hastings	City of Quinte West	OP
Hastings	City of Quinte West	Adopted OP with Revisions
Hastings	City of Belleville	OP Application
Hastings	City of Quinte West	OP
Lanark	Lanark Highlands	OP
Lanark	Tay Valley	OP, Consents
Lennox and Addington	Town of Greater Napanee	OP
Nipissing	South Algonquin Tp.	5 Consents
Northumberland	Brighton	OP Amendment
Northumberland	Town of Cobourg	OP
Northumberland	Hope	OP Amendment
Northumberland	Campbellford–Seymour, Percy, Hastings	Draft OP
Ottawa–Carleton	City of Nepean	OP
Renfrew	Renfrew County	OP
Renfrew	Petawawa	OP
Renfrew	City of Pembroke	Draft OP Application
Stormont, Dundas and Glengarry	North Glengarry	OP
Victoria	Kawartha Lakes	OP Pre-consultation

OP = Official Plans

The Regional Resident and District Geologists attended a number of interministerial meetings hosted by MMAH to review current Official Plans and related planning issues.

RESIDENT GEOLOGIST PROGRAM (RGP) STAFF AND ACTIVITIES

During 2002, staff of the Southern Ontario Regional Resident Geologist (Southeast) office included P.J. Sangster, Regional Resident Geologist; V.C. Papertzian, Southeast District Geologist; and D.A. Laidlaw, Southeast District Support Geologist. A. Quinney and J. Tabarez provided field season support under the Summer Experience Program.

The Tweed Office was closed during the OPSEU work stoppage from March 13 to May 6, 2002. The Regional Resident Geologist was re-located to the Mines and Minerals Information Centre in Toronto for the duration of the work stoppage. Office statistics for the year reflect the 2-month closure.

There are over 6900 Mineral Deposit Inventory (MDI) records for southeastern Ontario. During 2002, the District Support Geologist was principally responsible for verifying the MDI database. Other staff continued adding information related to new client property visits. In 2002, 481 MDI files were reviewed.

Southern Ontario mineral potential and recommendations for exploration were presented at the annual Prospectors and Developers Association of Canada (PDAC) Convention in Toronto as part of the Ontario Geological Survey poster session. In April, the Regional Resident Geologist presented a talk and a poster on "Ontario Industrial Minerals" at both the Northeastern Ontario Mines and Minerals Symposium in Timmins and the Northwestern Ontario Mines and Minerals Symposium in Thunder Bay.

In September, the Resident Geologist was invited to give a talk on Ontario industrial minerals at the Quebec Prospectors Association annual symposium in Rouyn–Noranda. The District Geologist presented a poster and attended the Eastern Ontario Conference on Municipal Planning in Kingston.

In October, the Regional Resident Geologist, the District Geologist for southwest Ontario and Myra Gerow, MNDM Coordinator, Commodities Program, presented a poster on Industrial Minerals of Ontario at the Blendon Industrial Minerals Forum in Toronto. The Regional Resident Geologist wrote a field guide, organized and presented a field trip to 55 members of the Toronto Branch CIMM. "Ontario's Eastern Frontier" included stops at the Essroc quarry in Picton, the Picton kimberlite dike and the Cameco uranium refinery in Port Hope. The Southwest District and District Support geologists controlled logistics and acted as liaisons with the CIMM group for the tour. The Southeast District and District Support geologists provided field support on the day of the tour. Also in October, the Tweed Resident Geologist Program office hosted an OGS Precambrian Geology Section tour of mineral deposits and roadside geology of the Kingston area.

In December, staff attended the Ontario Prospectors Association symposium in Toronto, where a poster display on "Industrial Mineral Resources of Southern Ontario" was presented. In addition the Regional Resident Geologist prepared and presented a talk highlighting current production and potential for additional development of industrial minerals in Southern Ontario.

Staff conducted visits to 45 properties in the District during the 2002 field season. For a complete listing of field visits, please refer to Table 6.

During the course of the year, 30 industry assessment reports were processed and added to the Tweed Regional Resident Geologist office assessment file library. For details please refer to Table 3, this report. Table 7 provides a summary of office activity and Table 8 lists additions made to the Tweed technical library during 2002.

Southern Ontario Prospector's Association (S.O.P.A.)

During 2002, the Tweed Regional Resident Geologist Office (RRGO) continued regular liaison with S.O.P.A to provide improved service to the client group. In October, the RRGO organized and co-hosted "meet the Precambrian Geology Section" evening for S.O.P.A members. Presentations by Andy Fyon, Jack Parker and Mike Easton, of the Ontario Geological Survey, were featured.

Table 6. Field visits completed in 2002—Southern Ontario Regional Resident Geologist (Southeast). (Field visits within the District are keyed to Figure 3.)

No.	Property/Operation	Commodity
1.	Bannockburn, Madoc Tp.	Hazard inspection
2.	Belmont Rose, Belmont Tp.	Granite
3.	Birkendale quarry, Franklin Tp.	Granite flagstone
4.	Cameco, Port Hope	Uranium conversion plant
5.	Canadian Vermiculite, Galway Tp.	Vermiculite
6.	Canadian Wollastonite, Pittsburgh Tp.	Wollastonite
7.	Carbrock quarry, Elzevir Tp.	Crushed stone
8.	Carden granite, Carden Tp.	Granite prospect
9.	Dacre Industrial, Griffith Tp.	Marble
10.	Dale Ireland quarry, Galway Tp.	Limestone dimension stone
11.	Gold Base, Kennebec Tp.	Gold and base metals
12.	Graphite Mountain, Bedford Tp.	Graphite
13.	Haggarty Hermitage, Haggarty Tp.	Granite
14.	Hawley Wollastonite deposit, Olden Tp.	Wollastonite
15.	Holleford Crater, Portland Tp.	Scientific interest

No.	Property/Operation	Commodity
16.	International quartz property, McClintock Tp.	Crushed stone
17.	Jeff Parnell quarry, Galway Tp.	Limestone dimension stone
18.	Kingston area roadside geology tour, Pittsburgh Tp.	Scientific interest
19.	Lake in Mountain, Sophiasburgh Tp.	Scientific interest
20.	Larry Preston quarry, Galway Tp.	Limestone dimension stone
21.	Lockwood property, Elzevir Tp.	Calcitic marble
22.	Lydia Diamonds, Tudor Tp.	Diamonds
23.	MacDonald feldspar mine, Monmouth Tp.	Scientific interest, mineral specimens
24.	MacLean granite, Olden Tp.	Granite
25.	MacMillan quarry, Dungannon Tp.	Granite
26.	Merv Johnson quarry, Cavendish Tp.	Vermiculite
27.	Methuen granite, Methuen Tp.	Granite
28.	Omega Marble, Darling Tp.	Marble dimension stone
29.	Peridotite occurrence, Methuen Tp.	Scientific interest
30.	Picton kimberlite, Sophiasburgh Tp.	Scientific interest, kimberlite
31.	Picton limestone, Sophiasburgh Tp.	Cement
32.	Redstone quarry, Galway Tp.	Limestone dimension stone
33.	Regis Resources, Cavendish Tp.	Vermiculite
34.	Royel Paving quarry, Galway Tp.	Crushed stone
35.	Sheffield granite, Sheffield Tp.	Dimension stone
36.	Silver Crater, Faraday Tp.	Mineral specimens
37.	Skinner Property, Muskoka Lakes Tp. (RGP Sudbury District)	Granite prospect
38.	Stewart Lake, Bedford Tp.	Graphite
39.	Tatlock quarry, Darling Tp.	Calcium carbonate
40.	Tomclid, South Canonto Tp.	Magnetite
41.	Tudor gabbro, Tudor Tp.	Mineral specimens
42.	Tweed quarry, Hungerford Tp.	Marble dimension stone
43.	Varty Lake kimberlite, Camden Tp.	Scientific interest, kimberlite
44.	Wilberforce occurrence, Monmouth Tp.	Mineral specimens
45.	Wilson Stone, Camden Tp.	Dimension stone

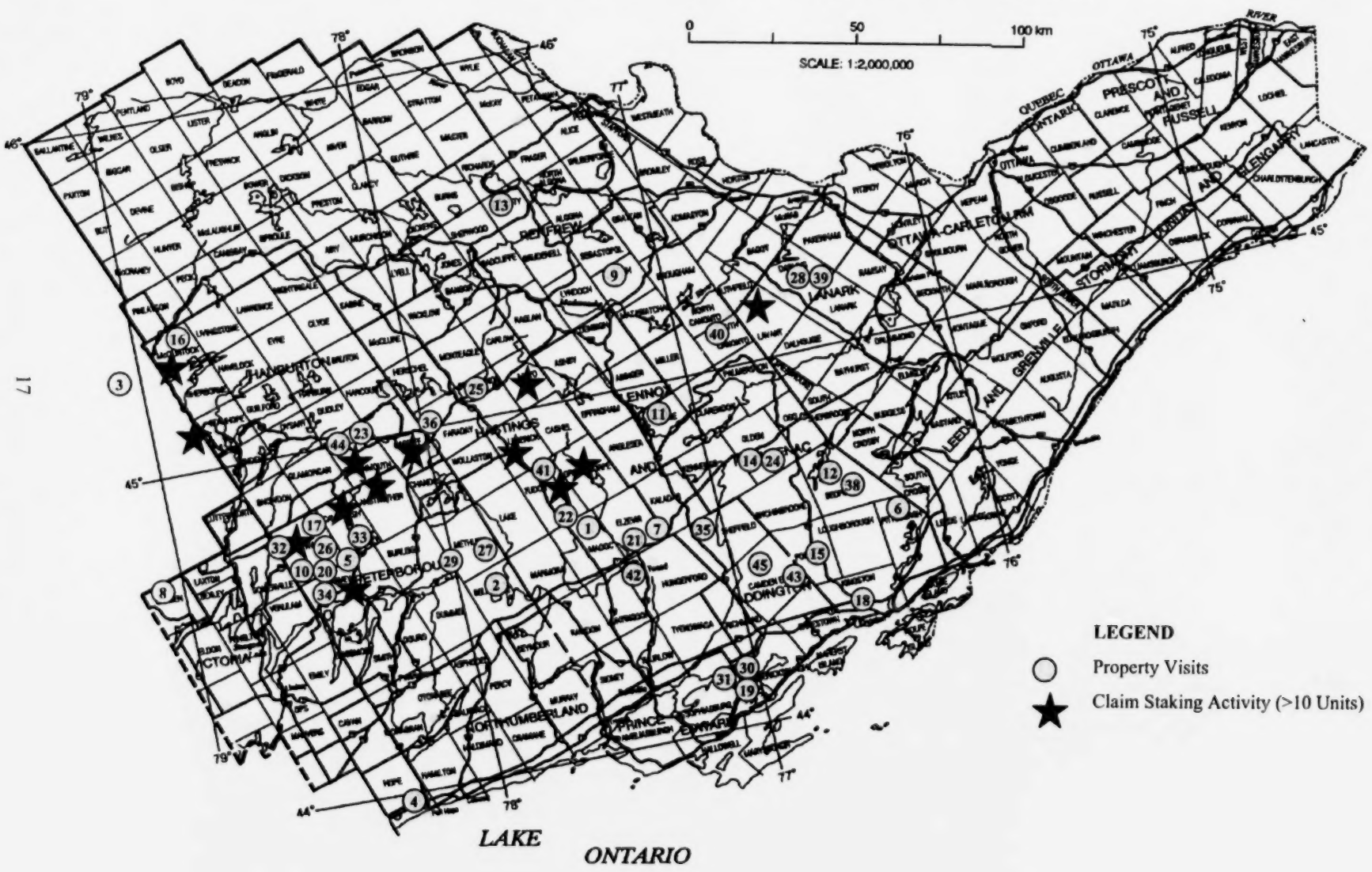

Figure 3: Property Visits and Claim Staking Activity in 2002 - Southeast District, Southern Ontario Regional Resident Geologist

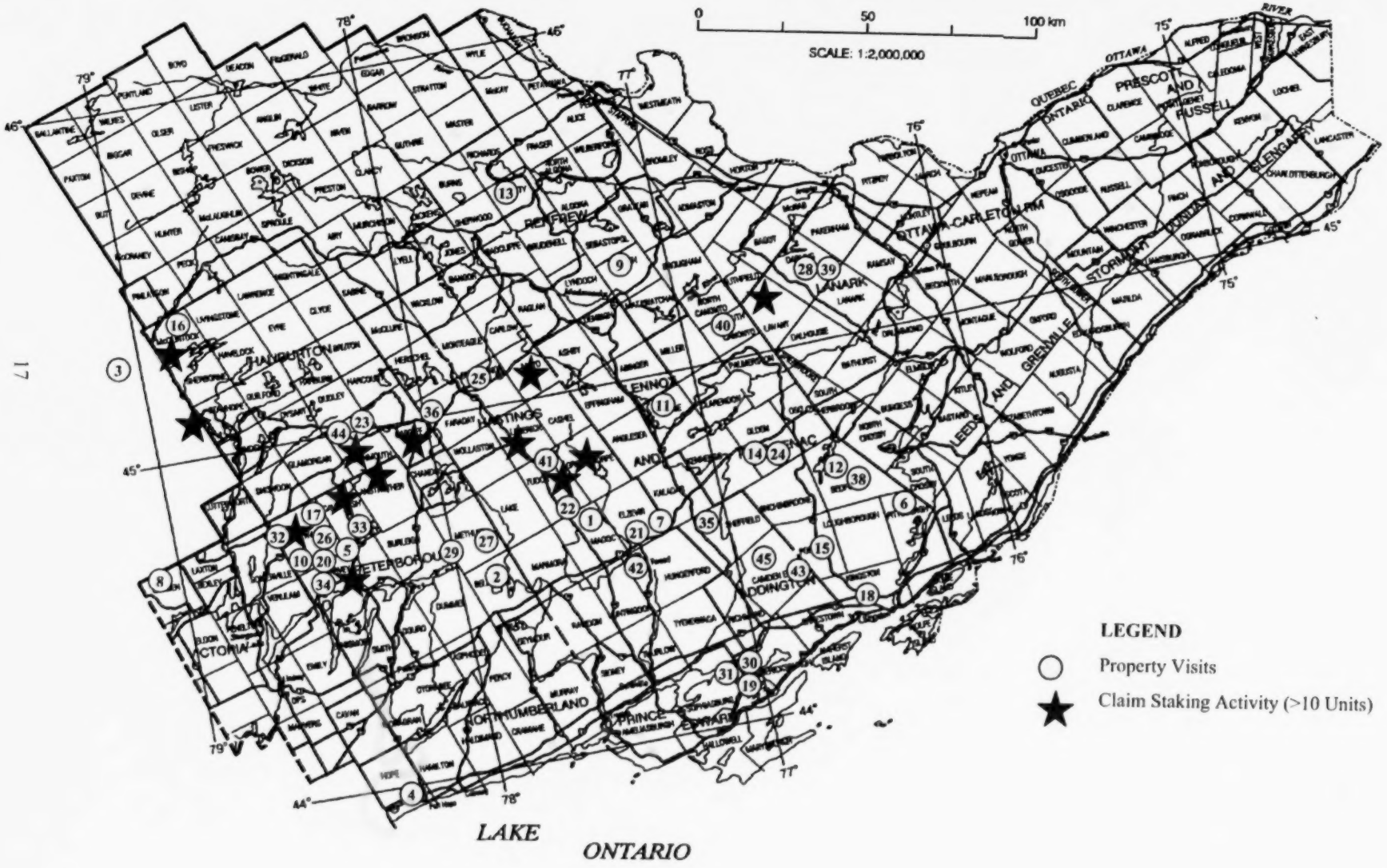

Figure 3: Property Visits and Claim Staking Activity in 2002 - Southeast District, Southern Ontario Regional Resident Geologist

Table 7. Office activity statistics for 2002—Southern Ontario Regional Resident Geologist (Southeast).

Activity	1998	1999	2000	2001	2002
Field Investigations/Property Visits	34	45	47	44	45
Field Trips Given/Field Guide Written	2	4	1	3	3
MDI Records Revised	0	1550	2690	906	481
OPAP Recipients	11	22	N/A	N/A	N/A
MMAH Presentations	4	3	2	4	2
Clients Visits to Tweed RGP Office	501	508	676	496	428
Drill Core Library Users	16	23	31	58	17
Client Communications/Interactions (Presentations/Poster Sessions)	N/A	2375	2619	3000+	2550*
Client Inquiries (Telephone/E-mail/Mail)	2172	2079	2163	2668	2400
OGS Publications Sold	112	73	93	89	108
Prospector's Licenses Sold	21	10	21	15	14
Claim/Line Tags Sold	197	408	261	742	131

*Includes presentations/posters at the PDAC Convention, NE, NW and S. Ontario OPA Regional Symposia, Quebec Prospectors Association Conference, Ontario Planning Conference, Industrial Minerals 2002 and OPA 2002 Conference.

Table 8. Library acquisitions in 2002—Southern Ontario Regional Resident Geologist (Southeast).

Title	Author	Type and Year of Publication
Canadian Mines Handbook 2001–2002	Giancola, D. (ed.)	Southam Mining Group, Toronto, 544p., 2001
Canadian Mines Handbook 2002–2003	Giancola, D. (ed.)	Business Information Group, Toronto, 624p, 2002
Canadian Vermiculite Industries Ltd.		CD-ROM, Canadian Vermiculite Industries Ltd., Concord, Ontario, 2002
Chariot 300 Stones	Chariot International Pvt.	CD-ROM, Chariot International Pvt., New Delhi, India, 2001
Geological and Topographical Map of the Madoc and Marmora Mining District	Coste, E. and White J.	Map, GSC, Ottawa, 1886
Minerals and Materials Information	United States Geological Survey	CD-ROM, USGS, Reston, Virginia, 2002
Mining Magazine (June to December 2002)	Chadwick, J. (ed)	Journal, Mining Journal Ltd., London, England, 2002
Ontario Dimension Stone—Producers & Processors Directory	Mines and Minerals Division	Directory, Ministry of Northern Development and Mines, Sudbury, 2002
Ontario Mining & Exploration Directory 2002	Van Reenen, E. (ed.)	Directory, Naylor Publications Company (Canada), Winnipeg, 54p., 2002
"Ontario's Eastern Frontier: Uranium, Diamonds and Cement"	Sangster, P., Steele, K., Borland, J., Barua, M., Laidlaw, D., Papertzian, C.	Field Trip Guidebook, CIMM Toronto Branch, Toronto, 2002
Overview of Trends in Canadian Mineral Exploration	Economic and Financial Analysis Branch	Mines and Metals Sector, Natural Resources Canada, Ottawa, 139p., 2002
Proceedings Industrial Minerals 2002, 14th Annual Canadian Conference on Markets for Industrial Minerals, Toronto, Ontario, October 22 to 23, 2002		Proceedings, Blendon Information Services, Toronto, 2002

Title	Author	Type and Year of Publication
Report of Activities 2001, Resident Geologist Program, Kirkland Lake Regional Resident Geologist Report: Kirkland Lake and Sudbury Districts	Meyer, G., Cosec, M., Grabowski, G., Guindon, D.L., Chaloux, E.C. and Stewart, J.M.	Ontario Geological Survey, Open File Report 6083, 112p., 2002
Report of Activities 2001, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts	Lichtblau, A., Hinz, P., Ravnaas, C., Storey, C.C., Kosloski, L. and Raoul, A.	Ontario Geological Survey, Open File Report 6079, 142p., 2002
Report of Activities 2001, Resident Geologist Program, Regional Land Use Geologist Report: Northwestern, Northeastern and Southern Ontario Regions	Debicki, R.L., Drost, A.P., Rowell, D.J. and Yule, G.R.	Ontario Geological Survey, Open File Report 6085, 17p., 2002
Report of Activities 2001, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Districts, Mines and Minerals Information Centre and Petroleum Resources Centre	Sangster, P.J., McGuinty, W.J., Papertzian, V.C., Steele, K.G., Lee, C.R., Laidlaw, D.A., Barua, M., Carter, T.R. and Parkes, B.D.	Ontario Geological Survey, Open File Report 6084, 102p., 2002
Report of Activities 2001, Resident Geologist Program, Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District	Mason, J.K., White, G.D., Scott, J.F., O'Brien, M.S. and Komar, C.	Ontario Geological Survey, Open File Report 6080, 50p., 2002
Report of Activities 2001, Resident Geologist Program, Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District	Schneiders, B.R., Scott, J.F., Smyk, M.C., Parker, D.P. and O'Brien, M.S.	Ontario Geological Survey, Open File Report 6081, 56p., 2002
Report of Activities 2001, Resident Geologist Program, Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts	Atkinson, B.T., Hailstone, M., Seim, G.Wm., Draper, D.M., Farrow, D. and Hope, P.	Ontario Geological Survey, Open File Report 6082, 98p., 2002
Rock of Ages – Building History	Rock of Ages	CD-ROM, Rock of Ages, Vermont, 2001
The Road to Success	Ontario Provincial Standards	VHS tape, Ontario Provincial Standards, 2002
Various diamond references with emphasis on New York state kimberlites		Donated by R.L. Moxham, 2002

PROPERTY EXAMINATIONS

Albert Banner, Ore Chimney Gold Prospect—Barrie Township

The Ore Chimney Gold prospect (the Bey Mine), is located in southeastern Ontario in Lennox and Addington County, Barrie Township, Concession 1, Lot 35, 44°46'34" latitude and 77°09'08" longitude. The property consists of patented claims: EO28666, EO29634 and EO28644. The Ore Chimney Gold prospect is one of several gold-quartz vein deposits found in this region of medium grade metamorphism within the Central Metasedimentary Belt of the Grenville province.

An initial discovery of gold was made in the northwest corner of claim EO29634 in 1902. This led to extensive underground development work conducted by the Ore Chimney Mining Company between 1909 and 1915. A two-compartment shaft was sunk to the 400-foot level, with a winze to the 500-foot level. The company conducted approximately 2200 feet of lateral development on the 108-, 150-, 250-, 300-, 32-, 400- and 500-foot levels.

Additional work completed on the property is as follows:

1928 - Mapping, trenching, geophysical surveying and diamond drilling undertaken by Bey Mines Ltd.
1932-1936 - Headframe refurbishment, underground sampling and some extension of drifts completed by Bey Mines Ltd.
1957 - Diamond drilling by Cavalier Mining Corp.
1983 - Main shaft re-timbered to the 150-foot level, underground sampling and mapping by Banirwin Mining and Exploration Co. Ltd.
1987 - Magnetometer, EM and Self Potential surveys, trenching and drilling carried out by Sands Minerals Corporation
1999 - Trenching, sampling, surface mapping carried out by Banirwin Mining Ltd.

The deposit consists of a northeast striking (030 to 040°), steeply dipping (70 to 85°SE), quartz vein zone entirely enclosed within a 30-feet thick layer of black hornblende-biotite schist that is a stratigraphic layer near the top of the basaltic flows of the Tudor metavolcanic rocks. As witnessed underground, the dip of the zone varies from 75°SE at the southwest end of the vein system, to 83°SE at the northeast end of the vein system where the main ore shoot is located (Logan 1932). This quartz vein zone appears to be a structurally and stratigraphically controlled zone of anastomosing, discontinuous quartz and quartz-carbonate veins varying from less than an inch in width to 1 to 2 feet in width in some places, and forming a complex vein zone varying from 3 to 8 feet in width.

The vein zone has been explored underground (in the workings and in drill holes) over a strike length of about 1100 feet and quartz veins have been traced in surface trenches over a larger distance; however, these outlying occurrences may not be continuous with the main zone. Campbell and Chamberlin (1957) stated that the vein on surface was covered by heavy overburden and could not be located. However, surface trenching in the early 1990s revealed high-grade mineralization in a new pit dug immediately above the stope on the 150-foot level which may represent the surface expression of the ore shoot. Underground on the 150-foot level, the veins commonly make up 30 to 50% of the zone with black schist making up the remainder of the ore zone. Individual veins along the back of the drift seldom exceed tens of feet in length and more commonly run 5 to 15 feet in length (P. Kingston, personal observation, 1983). The vein zone appears to have been extensively sheared and faulted within the plane of the veins thereby causing the discontinuous nature of quartz vein distribution. Small crosscutting faults that illustrate a few feet of displacement are occasionally observed. Campbell and Chamberlin (Cavalier Mining Corporation Limited, 1957) state that the vein at the 250-foot level is "a strong vein carrying heavy mineralization", and "the vein in the winze is massive quartz and carries heavy mineralization".

Sulphide mineralization occurs throughout the vein system but economic concentrations are largely confined to an ore shoot located at the northeastern end of the vein zone. This ore shoot appears to be continuous from a pit on surface to the 500-foot level and to a drill intersection 605 feet below surface. The ore shoot rakes southwest at about 60° at surface and down to the 250-foot level. Below this level the rake appears to gradually become steeper, reaching an angle of 70 to 75° at the 500-foot level. The ore shoot has an approximate strike length of 80 to 100 feet on various levels as best determined from the old mine plans.

Not all of the sulphide mineralization is enclosed within the quartz veins, as significant mineralization, including visible gold, has been noted in the enclosing black schist. The ore shoot varies from 1.5 to 7.0 feet in thickness, depending on the mine level. Distribution of mineralization appears to be structurally controlled throughout the vein zone, following a more or less central location through the vein zone. This distribution was well documented in the 1932 sampling plans and was observed in 1983 on the 150-foot level.

Gold values up to 0.18 ounces per ton were obtained from samples on surface in 1999. The highest silver assays range from 6.1 ounces per ton over 1.3 feet to 12.3 ounces per ton over 1.9 feet, 18.0 ounces per ton over 2.2 feet and 70.0 ounces per ton over 0.6 feet. Relatively higher values of gold correspond with the higher silver values, for example, 0.18 ounce per ton gold with 70.0 ounce per ton silver over 0.6 feet; and 0.02 ounce per ton gold with 12.3 ounce per ton silver over 1.9 feet.

A previous grab-sample taken in 1997 produced an assay of 75.45 ounce per ton silver near the east pit in the main trench. It has previously been noted that silver assays on the Ore Chimney Mine property tend to be higher on surface and decrease at depth, while gold assays follow the reverse pattern. Copper, lead and zinc values are notable

on occasion and reinforce the hypothesis that this geological environment is conducive for hosting base metal mineralization.

Albert Banner, the local prospector who had actively explored this property from the late 1970s to 2002, passed away in October after a lengthy illness.

Dacre Industrial Minerals, Marble Prospect—Griffith Township

The property is located in Renfrew County, Griffith Township, Concession 13, lots 10 and 11; latitude 45°19'4" and longitude 77°12'37".

Access to the property is by Highway 41 to Griffith, then north on the Highland Creek forest access road along the east side of the Madawaska River and along Highland Creek. Approximately 3.6 km, northeast of the third bridge across Highland Creek, a gravel road leads south for approximately 700 m to the quarry site.

LeBaron and MacKinnon (1990), describes the geology in this area as follows:

> A 40 to 50 m wide zone of white, coarse-grained dolomitic marble containing less than 3% impurities (phlogopite, serpentine and pale green mica) is exposed west of the dimension stone quarry and in the eastern part of the stripped area about 250 m northeast of the quarry. This zone, which strikes about 020° and dips 30°E, is flanked to the east by impure calcitic marble containing phlogopite, graphite, hematite, pyrite and local amphibolite bands. Narrow bands of dolomite and pink, granitic gneiss also occur within the calcitic marble area. No outcrop was mapped west of the dolomite zone, but diamond drill logs by Trisar Resources (1985) indicate impure dolomitic and calc-silicate rocks with narrow (3 to 5 m) bands of white dolomite. The dimension stone quarry is located immediately east of the white dolomite zone within a sequence of interlayered calcitic and dolomitic marbles containing 1 to 3 cm wide pale blue and green bands and crosscutting, pink calcite veins.

History of the property:

- 1982-1985 – Trisar Resources completed stripping, trenching and diamond drilling (5 holes) to evaluate the potential of the dolomite as an industrial filler.
- 1987 – Trisar Resources re-examined the 1985 drill core to determine if the marble could be utilized for dimension stone.
- 1988 – Two Island Marble Corp. commenced quarrying 6 to 11 t blocks of marble.
- 2000 – Dacre Industrial Minerals completed additional stripping in the quarry areas and completed some detailed geological mapping, paying particular attention to joints and joint spacing.

The property was visited on 2 separate occasions in the summer and fall of 2002. The first visit was in conjunction with a 4 hole, 1000-feet diamond drilling program. The holes were short and located close to the 2 existing quarries that span the strike length of the property. These holes were subsequently logged and additional stripping was based on this information. Three areas near the diamond drilling were stripped with the intent to remove a test block the following year. One 50-foot long trench to the north-northeast of the most northerly quarry was completed to determine depth to bedrock. This trench was subsequently filled in.

Stewart Lake Graphite Deposit—Bedford Township

The property is located in Frontenac County, Bedford Township, concessions 4 and 5, lots 3 to 5; latitude 44°33'44"; longitude 76°34'30".

Access to the property is via Highway 38 to county road 8 east from the hamlet of Godfrey for a distance of 5.1 km and then south on the Bunker Hill road for 3 km to Wilson road. This road is followed for 4.15 km to the exploration site located midway between Canoe and Desert lakes.

MacKinnon and LeBaron (1990), citing Hewitt (1965), describe the geology in this area as follows:

> Graphite occurs within siliceous marbles in the area between Canoe and Desert lakes as a series of NE trending lenses. The lenses lie along the contact between marble and quartzitic paragneiss on both limbs of an overturned synclinal structure. The syncline plunges northeastward at about 25 degrees and the west and east limbs dip eastward at about 45 and 70 degrees respectively. Stewart Lake Resources has identified 3 separate graphitic zones. The graphite occurs as thin flakes up to 3 mm in diameter, disseminated throughout the marble or in layers, in concentrations ranging from 2 to 20%. The graphitic lenses are highly folded and contorted, exhibiting large variations in dimensions and attitude over short distances. Maximum widths are in the order of 15m, but widths of 2 to 5m are much more common. Alteration of the marble along the quartzite contact to a granular aggregate of diopside, serpentine, carbonate and graphite is interpreted by Hewitt (1965) as a metasomatic replacement associated with hydrothermal solutions derived from the nearby granite.

History of the property:

- 1919 – Mining Corp. of Canada trenched, test pitted and diamond drilled 5 holes for a total length of 488 m;
- 1952 – Frobisher Ltd. completed 30 diamond drill holes totaling 9860 feet and a 300 ton bulk sample was extracted and shipped to Black Donald to be milled;
- 1953 – an electromagnetic survey was completed;
- 1985–1986 – Stewart Lake Resources acquired the property and completed detailed geological mapping;
- 1987–1989 – Stewart Lake Resources drilled 217 holes totaling 27 000 m of core, as well as conducted airborne magnetic and electromagnetic surveys and ground VLF and IP surveys;
- 1988 – Stewart Lake Resources started underground exploration, establishing levels at 15 m and 30 m and extracted 2700 t of graphite ore stockpiled on surface; and
- 1989 – Kilborn conducted a feasibility study for Stewart Lake Resources.

The property was visited on 2 separate occasions during the summer of 2002 with a rehabilitation officer from MNDM. The first site visit was in conjunction with a prospective buyer of the surface rights, while the second was with a township representative to examine the results of rehabilitation operation that had been conducted on the site. The surface has remained undisturbed since 1989 when Stewart Lake Resources ceased exploration operations. A steel bulkhead secures the opening to the ramp and underground workings. There is also a 3 m long adit near the shore of Desert Lake at the site where Frobisher Ltd. had extracted a 300 ton bulk sample. There are a number of overgrown trenches on site, the deepest measuring 1 to 1.5 m. Two overgrown settling ponds are located close to the sealed adit. There are still approximately 250 to 300 t of graphite ore remaining on surface in a number of 2 to 3 m high piles. In late 2002, the company holding the mortgage on the surface rights sold them to a buyer planning to construct a vacation home on the site. Dissolution of Stewart Lake Resources Inc. took effect on February 13, 1995. The unpatented mining claims reverted to the Crown in August 2002, but have not been re-opened for staking.

RECOMMENDATIONS FOR EXPLORATION

There are many high mineral potential areas in southeastern Ontario that remain inadequately explored despite the region's long history of mineral exploration and production. Historically, mineral exploration projects in the Grenville Province of southeastern Ontario have focused primarily on vein-hosted gold and base metal deposits. In recent decades the focus has also been placed on the search for industrial mineral deposits. Changing technology has resulted in new demands for certain commodities not previously considered to be significant. Table 9 provides a listing of known mineral deposits in southeastern Ontario that are not currently being mined. Table 10 lists occurrences compiled from the Mineral Deposit Inventory–2 database. Tables 11, 12, 13, and 14 of this report record the area's historic mineral production statistics.

Gold

Gold was first discovered in Ontario in 1866, near the community of Eldorado north of Madoc. Between 1895 to 1908, gold production peaked with 12 mines in production. In the 1930s Cominco Ltd. undertook extensive underground exploration at both the Cordova and Addington gold mines. By 1939 all gold production and exploration activity in the region had ceased. It was not until the late 1970s that exploration for gold commenced once again in this area, mainly due to the commodity's increased price. Exploration capital raised by "flow-through financing" along with new discoveries fueled renewed gold exploration activity during the 1980s. In 1990, gold exploration activity diminished once again, but revived in 1996. The price of gold subsequently fell until the present.

Currently gold exploration occurs in Marmora, Madoc, Tudor, Grimsthorpe, Kaladar, Barrie and Kennebec townships. Past producing mines and occurrences in this area are the Ackerman, Deloro, Gating Five-Acre, Deloro North, Sovereign, Dingman, Richardson, Bannockburn, Madoc Mining and the Gilmour.

The Dingman occurrence was discovered in 1985 near Malone and is a low-grade, large tonnage prospect, (7 million t grading at 1.8 g/t gold). This prospect is located in a very small, strongly sheared and altered intrusion close to the Deloro pluton. The northeasterly trending granite stock is approximately 800 m long and 80 to 150 m wide. In 1986, Noranda Exploration Co. Ltd. completed geological, geophysical and geochemical surveys over the property and in 1987–1988, the company completed a 38-hole diamond drilling program that totaled 5000 m. Metallurgical testing was also completed at this time. The property was optioned to Rajong Resources Ltd., who completed additional diamond drilling on the property. The company subsequently changed its name to Deloro Minerals Ltd. Previous to this, no work had been completed on this type of gold occurrence in this part of the Grenville.

Mono Gold Mines Inc. discovered high-grade gold mineralization near Bannockburn in 1984. The deposit occurs along a northeast trending linear (022°) and contains a resource of 225 000 t that grades at 9.15 g/t gold. Kingston and Papertzian (1997) describe this deposit as follows:

> [The gold occurs] in a number of crosscutting quartz veins hosted in pelitic metasedimentary and metavolcanic rocks on the south limb of a small anticline. Several episodes of deformation have strongly distorted the veins and given rise to the development of high-grade ore shoots within individual veins. Silicic and potassic alteration and the presence of bismuth sulphides and tellurides suggest a possible felsic intrusive affinity, possibly a granitic or syenitic body at depth within the core of the anticline.

It is recommended that exploration for gold be centred on small, sheared and altered, satellite granitic intrusions and associated faults and shear zones surrounding the west and north sides of the Deloro pluton (similar to the Dingman occurrence) and complex quartz vein systems (similar to Mono Gold Mines Ltd. deposit).

Mineral Fillers and Extenders—Muscovite Mica

An ideal mineral filler substance is inert, has consistent properties, a low specific gravity, is nontoxic, nonhazardous, nonabrasive and can be produced at a relatively low cost. Fillers reduce the consumption of more expensive raw materials such as wood fiber or plastic resin. Extenders enhance the final product by improving properties such as strength, flexibility and weight. The use of finely ground minerals as fillers and extenders in manufactured products has rapidly grown to become a multi-billion-dollar industry in North America alone.

With major production of calcium carbonate, talc and nepheline syenite, southeastern Ontario is already the site of a vital mineral filler and extender industry. Further evaluation of other minerals as fillers and extenders including, but not limited to, mica, titanium, wollastonite, calcite, and vermiculite is recommended.

There is a wealth of information published by the Ontario Geological Survey (OGS) on many potential mineral filler deposits in southeastern Ontario. In 2002, the Ontario Geological Survey released the results of a study evaluating the potential of approximately 200 documented mica occurrences in southern Ontario (Watts, Griffis and McOuat and OGS 2002: OFR 6086, *Industrial Mineral Assessment and Sampling of Mica in Central and Eastern Ontario*). The study was successful in identifying both a market for Ontario muscovite and highly prospective areas for muscovite in southeastern Ontario. Metasediment-hosted flake muscovite deposits were identified as the deposit type with the most economic potential.

Prospector Roger Young and industrial mineral geologist Robert Guillet discovered Ontario's first significant flake muscovite deposit near Kaladar. The deposit is 50 m thick with a strike length of 2.5 km and a reserve in excess of 10 000 000 tons. A muscovite grade of approximately 60% muscovite has been reported. At the time of the study, the deposit was under option and active evaluation and was not included in the field investigations. The deposit has since been returned to the property owners who are actively seeking opportunities (R. Guillet, personal communication, 2002). The mica study by Watts, Griffis and McOuat and OGS (2002) recognizes the economic potential of the Kaladar deposit and also recommends further exploration of the nose of the Clare River synform.

Table 9. Mineral deposits not currently being mined in 2002—Southern Ontario Regional Resident Geologist (Southeast).

Deposit/Township	MDI Number	Status	Commodity	Reserves	Reserve Reference
Ore Chimney prospect Barrie Township	MDI31C14SE-00142 (SO 1130)	I	Ag, Au ,Zn, Pb,	11 000 tons above the 500-foot level Averages. 0.2 oz/ton Au, 5.64 oz/ton Ag, 2.0% Zn and 1.0% Pb	MDC 12, p.132 MDC 18, p.33
Macassa Nickel Limerick Township	MDI31C13SE-00099 (SO 0595)	I	Ni ,Cu	2 000 000 tons @ 1.0% Ni, 0.25% Cu	MDC 12, p.138
Renfrew Zinc (Renprior) Admaston Township	MDI31F07NE-00063 (SO 0286)	A	Zn	16 000 tons @ 10.5% Zn to a depth of 30 m Breakwater Resources optioned the property to Noranda Mining and Exploration in 1996	MDC 12, p.226 MDC 20 p17
Harvey Simon prospect Lyndoch Township	MDI31F03NW-00044 (SO 0259)	I	Cu, Fe, Zn	250 000 tons @ 1.1% Cu to 350 feet	MDC 12, p.226 MDC 20, p.45
Clyde Forks deposit Lavant Township	MDI31F02SE-00064 (SO 0351)	I	Cu, Sb, Ag, Hg	60 000 tons @ 0.67% Cu, 0.37.0% Sb, 0.03% Hg and 1.32 oz/ton Ag	MDC 20, p.36
Twin Lakes diorite Methuen Township	MDI31C12NW-00114 (SO 3840)	I	Ti	13.2 million t of 21.7% TiO2, recoverable from open pit to a depth of 165 m, with rock:ore ratio = 0:54	CIM Bulletin, v.83, no.934, p.99
Grattan deposit Grattan Township	MDI31F06NE-00017 (SO 0270)	I	Fe	Proven: 3 639 600 tons to a vein depth of 363 ft Indicated: 9 099 000 tons to a vertical depth of 600 feet @ average grade of 27.74% Fe	MDC 20, p.98
Radenhurst-Caldwell deposit Lavant Township	MDI31F02NE-00012 (SO 0349)	I	Fe	Main lens 2000 feet long by 31.3 feet wide; contains 6 500 tons per slope foot at a grade of 32.77% Fe; 3 additional zones totaling 1600 feet in length average 17%, 16.7% and 25.5% Fe, respectively	MDC 20, p.104
Bessemer deposit Mayo Township	MDI31F04SE-00012 (SO 0235)	I	Fe	No.4 deposit 2 480 819 tons @ 28.62% recoverable Fe	MDC 20, p.110
Childs deposit Mayo Township	MDI31F04SE-00013 (SO 0236)	I	Fe	6 193 330 tons @ 19.25% recoverable Fe	MDC 20, p.114
Tomclid Magnetite South Canonto Township	MDI31F02SW-00032 (SO0282)	I	Fe	1993 published reserves estimated at 3 million t averaging 40% Fe; reserve estimate has not been adjusted to reflect production from the deposit in late-1990s	MP 161, p.377
Calabogie magnetite property Algoma Ore prop. Ltd. Bagot Township	MDI31F07SE-00009 (SO 0353)	I	Fe	Reserves of 45 million tons @ 25% Fe to 500 feet and 28% Fe to 1000 feet.	MDC 11, p.314
Buckhorn deposit Bagot Township	MDI31F07NE-00069 (SO0362)	I	Mo	Largest of numerous small lenses contains 1500 tons @ 1% MoS_2	MDC 20, p.132
Bannockburn (Madoc Mining Company Ltd.) Madoc Township	MDI31C12NE-00195 (SO 7274)	I	Au	225 000 tons grading 0.267 oz/ton Au	MP 161, p.377
Cooper Spruce Ridge Resources Ltd. Elzevir Township	MDI31C11SW-00044 (SO 2679)	I	Au, Talc	3 million t @ 30-33% recoverable talc and 40 000 t @ 8.0 g/t Au	OFR 5945, p.9 O2FR 5808, p.79

Deposit/Township	MDI Number	Status	Commodity	Reserves	Reserve Reference
Dingman deposit Deloro Minerals Ltd. Marmora Township	MDI31C12SE-00040 (SO 3590)	A	Au	7 million t @ 1.8 gpt Au	OFR 5958, p.11-13
Hawley Ram Petroleum Limited Olden Township	MDI31C10NW-00117 (SO 4057)	A	Wollastonite	2.5 million t @ 32% wollastonite to a vertical depth of 75 m	OFR 5943 p.337
Marmora Gitennes Exploration Inc. Marmora Township	MDI31C12SE-00096 (SO 3729)	I	Wollastonite	450 000 t (open pit) @ 47% wollastonite, plus 680 000 t @ 39% wollastonite in a separate zone	OFR 5715 p.50
Trudeau C. Roger Young Hungerford Township	MDI31C11SW-00049 (SO 1192)	A	Calcite, Dolomite	4 million t high-purity dolomite; no reserve estimate available for the calcite zone	OFR 5958 p.11-11
Verona-Kirkham Stewart Lake Resources Inc. Bedford Township	MDI31C10SE-00023 (SO 1244)	I	Graphite	1.6 million t grading 9.5% graphite in 2 separate zones	MDC 33, p.16
Cal Graphite Corp. Butt Township	MDI31E11NE-00004 (N0129)	I	Graphite	Reserves of 60 million t grading 3% graphitic carbon	MDC 33, p.10
Globe graphite mine North Elmsley Township	MDI31C16SE-00016 (SO 1604)	I	Graphite	500 000 t of approximately 7% graphite below mined out portion to the 300-foot level.	MDC 33, p.25
St. Lawrence Pacific Coast Mines Inc. Pittsburgh Township	MDI31C08NW-00058 (SO 8487)	I	Wollastonite	9-11 million t @ 43% wollastonite; 4-5 million t @ 34% wollastonite	MNDM www 1997

**(Table does not include nepheline syenite, trap rock, REE and dimension stone deposits. I = inactive, A = active)*

Table 10. Titanium, tantalum, REE occurrences compiled from MDI-2 database—Southern Ontario Regional Resident Geologist (Southeast).

Name	Township	MDI	Commodity	Deposit Status
Harrington, Marsh Ore Bed	Marmora	MDI31C05NE00135	Au, Fe, Ti	Occurrence
Green Island Rutile	Huntingdon	MDI31C06NW00088	Ti	Occurrence
Matthews, Newboro Lake	North Crosby	MDI31C09NW00009	Fe, Ti	Past Producer with Reserves
Chaffey	South Crosby	MDI31C09NW00011	Fe, Ti	Past Producer with Reserves
Tommy Lake	North Crosby	MDI31C09NW00131	Ti	Occurrence
Ricketts	Lake	MDI31C12NE00109	Fe, Ti	Occurrence
Orton	Tudor	MDI31C12NE00122	Fe, Ti	Past Producer w/o Reserves
Hastings Road Magnetite	Tudor	MDI31C12NE00185	Fe, Ti	Occurrence
Harold White, Twin Lake	Methuen	MDI31C12NW00114	Fe, Ti	Occurrence
Horse Lake, Tripp	Methuen	MDI31C12NW00127	Fe, Ti	Occurrence
Maloney	Marmora	MDi31C12SW00002	Cr, Cu, Fe, Ni, Ti	Past Producer w/o Reserves
Canadian Nickel	Methuen	MDI31C12SW00121	Ti	Occurrence
Ridgway	Marmora	MDI31C12SW00122	Cu, Fe, Ti	Occurrence
Jocko Lake	Limerick	MDI31C13NE00107	Fe, Ti	Occurrence
Umfraville	Wollaston	MDI31C13NW00057	Co, Fe, Phosphate, Ti	Occurrence

Name	Township	MDI	Commodity	Deposit Status
Canning Lake	Minden	MDI31D15NE00052	Fe, Ti	Occurrence
Pine Lake	Glamorgan	MDI31D16NW00215	Fe, Ni, Ti, V	Occurrence
Basin, Silver Crater (Basin)	Faraday	MDI31E01SE00054	Mica, Mo, Nb, Th, U, Ti	Past Producer w/o Reserves
Allen Lake	Harcourt	MDI31E01SE00306	Fe, Ti	Occurrence
Gal-Wood	Sabine	MDI31E08NE00010	Gd, Nb, Ta, Ti, U	Occurrence
Woodcox	Monteagle	MDI31F04NW00020	Ce, Feldspar, Nb, U, Ta, Th, Ti, Zircon	Past Producer w/o Reserves
Macdonald Mine	Monteagle	MDI31F04NW00023	Cu, Feldspar, Mo, Nb, REE, Th, Ti, U, Zircon	Past Producer w/o Reserves
Opeongo	Sebastopol	MDI31F06NE00093	Ag, Ce, Nb, Ta, Th, Ti, U, Y, Zircon	Occurrence
East Rockingham	Brudenell	MDI31F06NW00085	Au, Ti	Occurrence
South Lamberts	Griffith	MDI31F06SE00161	Ti	Occurrence
Horton Twp, Ottawa River	Horton	MDI31F10SE00019	Fe, Ti	Occurrence
Mahoney and Morin	Sabine	MDI31E08SE00002	Feldspar, Nb, REE, Ta, U	Past Producer w/o Reserves
Genesee No. 2 South	Monteagle	MDI31F04NW00018	Feldspar, Nb, Si, Ta, Th, U	Past Producer with Reserves
Plunkett, Plunkett South	Monteagle	MDI31F04NW00019	Ce, Feldspar, Amethyst, Mo, Nb, Th, Ta, U	Past Producer w/o Reserves
Dubblestein	Bangor	MDI31F05SW00010	Nb, Ta, Th, U	Occurrence
Tooeys Lake, Tooley Lake	Brougham	MDI31F06SE00090	Nb, Ta, Th, U	Occurrence
Renfrew Minerals, Wal-Gem West Quarry	Lyndoch	MDI31F06SW00013	Be, Feldspar, Fluorite, Mo, Nb, REE, Si, Ta, Th, U, Zircon	Producing Mine
Barr Feldspar Quarry, Woermke	Fraser	MDI31F14SW00003	Ce, Feldspar, Nb, Ta, Th, U	Past Producer w/o Reserves
Quinn	Olden	MDI31C10NW00366	Cu, Ni, REE	Occurrence
Orser-Kraft	South Sherbrooke	MDI31C15SE00027	Feldspar, Nb, REE, Th, U	Past Producer w/o Reserves
Nobles Bay, Rogers, J.	North Burgess	MDI31C16SE00004	Mica, REE	Past Producer w/o Reserves
Maclaren, Willaim L.	North Burgess	MDI31C16SW00017	Mica, Phosphate, REE	Past Producer w/o Reserves
Christie Lake	South Sherbrooke	MDI31C16SW00142	Magnetite, Nb, REE	Occurrence
Drude South	Cavendish	MDI31D09NW00079	REE, Th, U	Occurrence
Copper Anomaly	Lutterworth	MDI31D15SE00151	Cu, REE, Sr, Zircon	Occurrence
Rare Earth Anomaly	Lutterworth	MDI31D15SE00152	Cu, REE, Sr, Zircon	Occurrence

Name	Township	MDI	Commodity	Deposit Status
North Rare Earth Anomaly	Lutterworth	MDI31D15SE00153	Cu, REE, Sr, Zircon	Occurrence
Laurencin, Milhol	Cardiff	MDI31D16NE00160	Mo, REE, Th, U	Occurrence
Mclennan, J.G.	Peck	MDI31E07NE00006	Nb, REE	Occurrence
Malcovitch, P.	Clyde	MDI31E08NW00003	Ce, REE, U	Occurrence
Gole, J.G.	Murchison	MDI31E09SE00004	Feldspar, Nb, REE, Si, U, Zircon	Past Producer w/o Reserves
Cameron and Aleck	Murchison	MDI31E09SE00005	Feldspar, Nb, REE	Past Producer w/o Reserves
D'Eldona, Yankee Dam	Butt	MDI31E11NE00070	Nb, REE, U	Occurrence
Plunkett North	Monteagle	MDI31F04NW00185	Feldspar, REE, U	Occurrence
Lake Clear	Sebastopol	MDI31F06NE00092	REE, Th, U	Occurrence
Price, E.C., Quadeville	Lyndoch	MDI31F06SW00014	Be, Feldspar, Fluorite, Nb, Phosphate, REE, Si, Th, U, Zircon	Producing Mine
Universal Light Metals	Lyndoch	MDI31F06SW00065	Be, Ce, Nb, REE, Th, U	Occurrence
Lake Property, Lake Mine	Dickens	MDI31F12SW00006	Feldspar, REE	Past Producer w/o Reserves

Note: MDI-2 database was queried for Ti, Ta and REE occurrences. This listing indicates the presence of the commodities, not necessarily their order of abundance. This list should be used as a preliminary guide. Hard copies of these complete MDI files are located at the RGP office in Tweed.

Table 11. Historic production of gold—Southern Ontario Regional Resident Geologist (Southeast).

Mine	Township	Operating Years	Tons Milled	Ounces Produced	Grade (oz/ton)
Big Dipper	Barrie	1907-09	52	17	0.33
Cook	Marmora	1901-04	1483	289	0.26
Cordova	Belmont	1892	120 670	22 774	0.19
Craig	Tudor	1905-06	1850	248	0.13
Deloro	Marmora	1897-02	39 143	10 360	0.26
Gatling 5 Acre	Marmora	1900-03	6114	2353	0.38
Gilmour	Grimsthorpe	1909-10	550	172	0.31
Golden Fleece	Kaladar	1919-22	Unknown	480	Unknown
Ledyard	Belmont	1893-94	55	13	0.24
Pearce	Marmora	1893-08	239	302	1.26
Sophia	Madoc	1900-41	1800	110	0.06
Sovereign	Marmora	1878 1892-1900	Unknown 1962	970 370	Unknown 0.19
Star of the East	Barrie	1905-07	976	134	0.14
		Total	174 894	38 592	

Table 12. Historic production of copper, lead, zinc—Southern Ontario Regional Resident Geologist (Southeast).

Mine	Tp.	Operating	Tons Milled	Production
Kingdon	Fitzroy	1884-85, 1914-31	905 000	76 821 409 lbs Pb conc.; 857 312 lbs Zn conc.; 60 074 072 lbs Pb rec
Long Lake	Olden	1897-25, 1973-74	3 442 , NA	$41 550 ore value, 9467 tons Zn valued at $1 227 000
Eldorado Copper	Madoc	1906	NA	234 000 lbs Cu matte containing 230 oz Au, 182 oz Ag, 109 000 lbs Cu
Hollandia Lead	Madoc	1903-06	NA	2 653 365 lbs Pb

Table 13. Historic production of iron—Southern Ontario Regional Resident Geologist (Southeast).

Mine	Township	Operating Years	Tons Milled	Grade (% Fe)
Calabogie	Bagot	1883-1901	10 000	26
Martel	Bagot	Pre 1890	2000	58.71
Williams (Black Bay)	Bagot	1880-90	25 000	51.89
Black Lake	Bedford	1882-1884	4000	40
Glendower	Bedford	1873-1895	50 000	50-60
Belmont (Ledyard)	Belmont	1899-1900, 1911-1913	8 433	51.2
Blairton	Belmont	1820-1875	300 000	51.8
Playfair (Dalhousie)	Dalhousie	1866-71	11 100	57.6
Radnor	Grattan	1901-1907	18 824	47.5
Eagle Lake (Blessington)	Hinchinbrooke	1887-1891	700	65.55
Tomahawk (Mag-Iron)	Lake	1947, 1950-57	2 096	50.9
Wilbur	Lavant	Pre 1900, 1907-8	146 892	56.69
Magnetawan	Lount	1910-1912	6000	59.55
Paxton	Lutterworth	Before 1910	1000	NA
Miller	Madoc	1899	6823	NA
Wallbridge	Madoc	1900-01, 1919, 1921	3421	NA
Marmoraton	Marmora	1952-1978	28 000 000	40
Bessemer	Mayo	1902-13	99 613	42.18
Childs	Mayo	1913	9649	38.7
McNab	McNab	1873-74	15 000	68
Robertsville & Mary	Palmerston	1895, 1900-1, 1918-9	13 477	70.5
Fournier	S. Sherbrooke	1873	600	60
Howland	Snowdon	1880-2	1500	58
Victoria	Snowdon	1882	?	58.35
Dog Lake	Storrington	1899	600	51.12
St. Charles	Tudor	1900-02	5186	57-60
Coe Hill	Wollaston	1884-1914	100 000	51.4
Total			28 841 914	

Table 14. Historic production of fluorite—Southern Ontario Regional Resident Geologist (Southeast).

Mine	MDI Number	Township	Operating Years	Total Production (Tons)
Bailey	31C06NW00003	Madoc	1907, 1916, 1917, 1944-50	25 000
Blakely	31C06NW00019	Huntingdon	1918-20, 1928, 1941-47	5026
Coe	31C06NW00008	Huntingdon	1941-42	114
Dwyer	31E01SE00091	Cardiff	1918-20, 1943, 1944	97
Herrington South	31C05NE00009	Huntingdon	1917	13
Howard, Fred Hill	31C06NW00014	Huntingdon	1918, 1920, 1929, 1940-42, 1944	2500
Johnston	31C06NW00013	Huntingdon	1943, 1944-47, 1949	187
Keene	31C06NW00004	Huntingdon	1918-19, 1943, 1944, 1950	5000
Kilpatrick	31C06NW00005	Huntingdon	1944, 1953-1959	11 566
Lee Junior	31C05NE00008	Madoc	1917, 1940, 1943-45	2000
Lee Senior	31C05NE00006	Madoc	1916-1918, 1942, 1943	1600
McIlroy	31C05NE00003	Madoc	1917-18, 1923, 1944	540
Miller	31C05NE00005	Madoc	1917-1919	460
Noyes	31C06NW00011	Huntingdon	1917-20, 1941-43	25 000
Palmateer	31C06NW00016	Huntingdon	1942	44
Perry	31C06NW00009	Huntingdon	1915-20, 1941-43	8000
Perry Lake	31C06NW00007	Huntingdon	1910, 1913, 1915, 1917, 1952, 1960	4000
Ponton	31C05NE00004	Madoc	1929-1942	1500
Rogers	31C06NW00018	Huntingdon	1909-1914, 1943-51	45 000
Rooks	31C12SE00003	Madoc	1916-18	100
South Reynolds	31C06NW00010	Huntingdon	1917-18, 1943	100
Wallbridge & Herrington	31C05NE00007	Madoc	1920-1922, 1941-1943	6600
William Reynolds	31C12SE00002	Madoc	1941-42	88

Fluorspar, a commercial fluorite product, is used as a flux in the making of steel and ceramics, as a constituent in the electrolytic process of making aluminum and in the production of hydrofluoric acid (HF). During World War II, a Canadian Government assistance program, in the form of loans and drill hole explorations, stimulated development of the Madoc deposits (G. Guillet, IMR 12, p.1).

OGS ACTIVITIES AND RESEARCH BY OTHERS

Table 15 lists new OGS publications pertaining to southeast Ontario geology released or received by the Tweed office in 2002.

Queenston Formation—Russell Quarry Drill Hole

In 2000, the Ontario Geological Survey initiated a study of the Upper Ordovician Queenston Formation, the main source of shale for Ontario's brick industry. The study was undertaken in recognition of increasing land use pressures and restrictions limiting future access to the resource.

In the winter of 2002, drill hole OGS-01-06 was cored from the top of the east wall of the Russell Quarry to a depth of 60.97 m. The basal contact of the Queenston Formation with underlying grey shales and limestone was intersected at 10 m below the quarry floor. For complete results of the program, please refer to Open File Report 6094, *Data for the Comparative Resource Evaluation of Selected Shale Units, Southern Ontario* (Armstrong and Sergerie 2002).

Operation Treasure Hunt—Industrial Mineral Project

Results of the study completed by the consulting firm Watts, Griffis and McOuat to assess the potential of white mica in southern and central Ontario were released in an Open File Report in 2002 (*see also* discussion under "Mineral Fillers and Extenders—Muscovite Mica", above). The project included field and laboratory examination of known deposits and a detailed market study.

Table 15. Publications of Ontario Geological Survey activities in 2002—Southern Ontario Regional Resident Geologist (Southeast).

Title	Author	Type and Year of Publication
Data for the Comparative Resource Evaluation of Selected Shale Units, Southern Ontario	Armstrong, D.K. and Sergerie, P.	Ontario Geological Survey, Open File Report 6094, 160p., 2002
Geochemistry of Selected Ordovician and Silurian Shale Samples from Outcrops, Quarries and Drill Cores, Southern Ontario	Armstrong, D.K. and Sergerie, P.	Ontario Geological Survey, Miscellaneous Release—Data 107, 2002
Geological and Lithogeochemical Data from Mafic-Ultramafic Bodies in Ontario as a Guide to Exploration for Platinum Group Element (PGE) Deposits: Operation Treasure Hunt	Vaillancourt, C., Sproule, R.A., MacDonald, C.A. and Takats, P.A.	Ontario Geological Survey, Miscellaneous Release—Data 115, 2002
Industrial Mineral Assessment and Sampling of Mica in Central and Eastern Ontario	Watts, Griffis and McOuat and Ontario Geological Survey	Ontario Geological Survey, Open File Report 6086, 124p., 2002
Magmatic Ni - Cu ± PGE Occurrences and Mafic-Ultramafic Bodies in Ontario	Hulbert, L. and Vaillancourt, C.	Ontario Geological Survey, Miscellaneous Release—Data 100, 2002
Report of Activities 2001, Resident Geologist Program, Regional Land Use Geologist Report: Northwestern, Northeastern and Southern Ontario Regions	Debicki, R.L., Drost, A.P., Rowell, D.J. and Yule, G.R.	Ontario Geological Survey, Open File Report 6085, 17p., 2002
Report of Activities 2001, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Districts, Mines and Minerals Information Centre, and Petroleum Resources Centre	Sangster, P.J., McGuinty, W.J., Papertzian, V.C., Steele, K.G., Lee, C.R., Laidlaw, D.A., Carter, T.R. and Parkes, B.D.	Ontario Geological Survey, Open File Report 6084, 102p., 2002
Results of 2001-2002 Shale Drilling Program: Lithologic Core Logs, Major, Minor and Trace Element Analyses	Armstrong, D.K. and Sergerie, P.	Ontario Geological Survey, Miscellaneous Release—Data 112, 2002
Summary of Field Work and Other Activities 2002, Ontario Geological Survey	Baker, C.L., Debicki, E.J., Kelly, R.I. and Parker, J.R. (ed)	Ontario Geological Survey, Open File Report 6100, 2002

University of Toronto, Geology Department

Dr. W.M. Schwerdtner, University of Toronto, discovered a major deformation zone marking the northwest boundary of the Mazinaw domain as a result of field work in 2002. The zone consists of mylonites and straight

gneisses, locally replete with concordant veinlets of quartz. Previous mapping defined a well-exposed segment of the zone at the dam of Calabogie Lake and adjacent river gorge. Dr. Schwerdtner has now identified the zone east of Mazinaw Lake and in the vicinity of Lucky Lake, north of Plevna. (W.M. Schwerdtner personal communication, 2003.)

S.A. Alexander will produce the first draft of her MSc thesis by May 2003. One research objective is to establish direct links between the micro-structural and petrologic histories of various rocks in a study area between Actinolite, Moira Lake and Queensborough. Work is focussed on rocks at the Mazinaw domain boundary on and near Highway 7, but also includes detailed macro-structural traverses across that boundary. (W.M. Schwerdtner, personal communication, 2003.)

M.W. Downey completed a BSc degree in spring 2002. The main results of Downey's structural research are summarized in a manuscript by Schwerdtner, Downey and Alexander titled *L-S shape fabrics in the Mazinaw domain and the issue of NW-directed thrusting in the Composite Arc Belt, southeastern Ontario* to be published in a Geological Society of America Special Paper on the Grenville Orogen (W. M. Schwerdtner personal communications, 2003).

Structural Field Mapping, Structural Petrography and Geochemistry of the Addington Granite

PhD candidate J. Burke continued a study of the Addington Granite, a major unit of the southern section of the Mazinaw Terrane, under the supervision of P. Robin and W.M. Schwerdtner, Department of Geology, University of Toronto. The project examines the Addington Granite, its internal structure and relationships to other rocks in the same southern section of the Mazinaw Terrane. Focus is placed on the Addington Granite, the nature of its contacts with its various hosts, mechanisms of igneous emplacement, and the nature of its deformation both during and after its emplacement. In 2002, Mr. Burke completed structural field mapping, structural petrography and geochemistry research in the eastern part of the study area. Based on detailed structural measurements in the field, several vertical sections across the main mass of the Addington Granite, between Actinolite and Kaladar, have been drawn. (J. Burke, W.M. Schwerdtner, personal communication, 2002, 2003.)

Geological Survey of Canada—Potsdam Group Arthropod Trackways

In June 2002, the Geological Survey of Canada released a paper on the presence of arthropod-produced trackways in sandstones of the Cambro-Ordovician Nepean Formation (Potsdam Group) near Kingston, Ontario. The occurrence of these tracks at this locale extends the landfall of nonmarine arthropod activity by 40 m.y. (MacNaughton 2002).

REFERENCES

Armstrong, D.K. and Sergerie, P. 2002. Data for the comparative resource evaluation of selected shale units, southern Ontario; Ontario Geological Survey, Open File Report 6094, 160p.

Campbell, C.A. and Chamberlin, L. 1957. Unpublished report made to the President and directors of the Cavalier Mining Corporation Ltd, Tweed Resident Geologist Office Assessment Files 22p.

Derry, Michener, Booth and Wahl and Ontario Geological Survey, 1989. Limestone industries of Ontario, Volumes II and III, Ontario Ministry of Natural Resources, Land Management Branch.

Harburn, P. 1996. Industrial minerals, a global geology; Industrial Minerals Information Ltd., Surrey, UK 462p.

Hewitt, D.F. 1967. Pegmatite mineral resources of Ontario; Ontario Department of Mines, Industrial Mineral Report 21, 83p.

Hewitt, D.F., 1965. Graphite in Ontario; Ontario Deparment of Mines, Industrial Mineral Report No. 20, 66p.

Kingston, P.W. and Papertzian, V.C. 1997. Southeastern (Tweed) Resident Geologist's District—1996; *in* Report of Activities 1996, Resident Geologists; Ontario Geological Survey, Open File Report 5958, 465p.

LeBaron, P.S. and MacKinnon, A. 1990. Precambrian dolomite resources in southeastern Ontario; Ontario Geological Survey, Open File Report 5712, 134p.

Logan, H.J., 1932. Unpublished Engineers Report, The Bey Mines Ltd., Tweed Regional Resident Geologist Office Assessment Files 4p.

MacKinnon, A., Kingston, P.W., and Springer, J.S. 1990. Vermiculite in the Stanleyville area, eastern Ontario; Ontario Geological Survey, Mineral Deposits Inventory Circular 31, 42p.

MacKinnon, A. and LeBaron, P.S. 1990. Major graphite occurrences within the Frontenac Axis, southeastern Ontario; Open File Report 5729, 77p.

MacNaughton, R.B., Cole, J.M., Dalrymple, R.W., Braddy, S.J., Briggs, D.E.G., Lukie, T.D. 2002. First steps on land: arthropod trackways in Cambrian-Ordovician eolian sandstone, southeastern Ontario, Canada; Geology, v.30, p.391-394.

Sangster, P.J., Papertzian, V.C. and Laidlaw, D.A. 2002. Report of Activities, 2001, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Districts, Mines and Minerals Information Centre and Petroleum Resources Centre. Ontario Geological Survey, Open File Report 6084, 102p.

Sangster, P.J., 2002. Ontario's eastern frontier: diamonds, uranium and cement; unpublished field trip guidebook.

Sangster, P.J. 2002. Mineral deposits and roadside geology of the Kingston area; unpublished field trip guidebook.

Thompson, L.D.G. 1996. Unpublished OPAP Report (OP96-032) Tomclid Iron Mine property, 9p.

USGS 2000. Mineral Commodity Summaries; United States Geological Survey, 197p.

Watts, Griffis and McOuat and Ontario Geological Survey, 2002. Industrial mineral assessment and sampling of mica in central and eastern Ontario; Ontario Geological Survey, Open File Report 6086, 124p.

Ontario

Ontario Geological Survey
Resident Geologist Program

Southern Ontario Regional Resident Geologist
(Southwest Ontario District)—2002

by

K.G. Steele and M. Barua

2003

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Southern Ontario Regional Resident Geologist (Southwest Ontario District)—2002

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SOUTHERN ONTARIO REGIONAL RESIDENT GEOLOGIST (SOUTHWEST ONTARIO DISTRICT)--2002

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INTRODUCTION

In 2002, the mining and quarrying of minerals in the Southwest Ontario District resulted in approximately $1.59 billion of economic activity. Four mines, 37 quarries and 3 brine well fields extracted industrial minerals, non-aggregate stone and building stone throughout the year. These operations, including on-site processing facilities, employed approximately 3000 Southwest Ontario District residents in 2002.

All of Ontario's production of salt, gypsum/wallboard, natural gas and petroleum, and most of the province's production of shale/brick, lime/dolime, cement, sand and gravel, and stone comes from the Southwest Ontario District. Throughout 2002, the market demand for clay brick, cement, building stone, and aggregate continued to be very strong. Three newly developed building stone quarries, 2 near Wiarton and 1 northwest of Orillia, reached significant production levels in 2002.

Exploration, advanced exploration and development activity increased in 2002. Projects for dimension/landscape stone, cement stone, high-calcium limestone, aggregate, shale/brick, zinc and other commodities should result in a number of new quarries and/or mines in production over the next 5 years.

In 2002, Southwest Ontario District staff visited 22 mineral extraction or processing sites, revised over 100 Mineral Deposit Inventory records, provided field trips for industry clients and held exhibits at 4 conferences and trade shows. Staff made significant contributions to 2 public education projects: PDAC Mining Matters and Geoscape Toronto.

Recommendations are presented for supplying high-quality crushed stone aggregate for the Greater Toronto Area market, as well as for the exploration for shale, and high-purity dolostone and limestone, resources in southwest Ontario.

MINING ACTIVITY

In 2001 (the last year for which statistics are available; Table 1), the mining and quarrying of industrial minerals in the Southwest Ontario District generated approximately $1.59 billion of production value or approximately 28% of Ontario's overall revenues from mineral production.

All of the province's salt, gypsum, natural gas and petroleum production, almost all of the clay/shale products and lime production, as well as a large percentage of the cement, sand and gravel, and stone production comes from the Southwest Ontario District. The locations of all active mineral extraction operations in southwest Ontario are shown on Figure 1 (operations that extract construction aggregate, natural gas or petroleum are not included). The mines, quarries and brine well fields listed extract a variety of commodities for numerous end products, including salt (road salt, chemicals, food), gypsum (wallboard), limestone (lime, cement, glass, steel, building stone), shale (cement, bricks), dolostone (chemicals, glass, steel, building stone), sandstone (building stone) and gneiss (building stone, speciality aggregate).

Reported production figures for the 2 underground salt mines and 2 underground gypsum mines operating in the Southwest Ontario District are presented in Table 2.

All of the province's oil and gas production occurs in the Southwest Ontario District, in an area that stretches from Niagara Falls to Windsor–Sarnia, including Lake Erie.

Producers and Recent Developments

SALT

In 2002, 3 companies extracted salt in Ontario, all within the Southwest Ontario District (Figure 1). Sifto Canada Inc., located at Goderich, and The Canadian Salt Company Limited, located in Windsor, operate both rock salt mines and brine well fields. General Chemical Canada Limited operated, in a limited manner, a brine well field south of Windsor near Amherstburg.

Compass Minerals Group Inc. of Overland Park, Kansas, was spun off from IMC Global Inc. in November 2001 and is now owned 80.1% by Apollo Management LP and 19.9% by IMC Global. The company, which is the parent company of Sifto Canada Inc., is the second largest producer of salt and the largest producer of concentrated phosphates in North America, and the largest producer of salt in the United Kingdom. Rohm and Haas Co. of Philadelphia, Pennsylvania, the parent company of The Canadian Salt Company Limited, is the largest producer of salt in North America (Blendon Information Services, April 2002).

Rock salt production decreased approximately 14% from the previous year due to the reduced demand for road salt related to mild winter conditions during 2001–2002 in Ontario and other parts of central North America. Ontario rock salt production in 2002, at 7.4 million t, was higher than production in 1999 and 2000 (Table 2) (J. Vincent, The Canadian Salt Company Ltd. and R. Howe, Sifto Canada Inc., personal communication, January 2003). Weather conditions of the 2002–2003 winter to date, suggest that rock salt production will be up in 2003.

In November 2001, the Canadian government published a recommendation that road salt, which contains inorganic chloride salts, be added to the Schedule 1 list of toxic substances under the Canadian Environmental Protection Act (CEPA). The action follows the release of a five-year scientific assessment by Environment Canada, which concluded that road salts in sufficient concentrations pose a risk to the aquatic environment, plants and animals. Under CEPA, provincial governments would have 2 years to develop management measures to reduce the impact of road salts on the environment and a further 18 months to implement these measures.

As of the end of 2002, Canada's Minster of the Environment had yet to make a final decision on whether to add road salts to the country's list of toxic substances under the CEPA. Environment Canada, however, is proceeding with the development of codes of practice to reduce the impact of road salts on the environment. A working group consisting of government and industry representatives met 3 times in 2002 to discuss best practices for the application, storage, and disposal of road salt. The proposed control measures are expected to be published in the Canada Gazette in the fall of 2003.

In the past year, demand for general trade salt remained robust and production from brine at Goderich and Windsor continued at plant capacities. In 2002, Sifto Canada Inc. significantly increased production capacity at its Goderich Evaporation Plant. Much of the increased capacity will be used in 2003. Starting in 2002, Compass Minerals Group, including Sifto Canada, is concentrating its marketing efforts on higher value-added applications in water conditioning and agriculture. In the third quarter of 2002, Compass Minerals Group increased its general trade salt business sales volume by 40 000 tons which translates into US$2 million in revenue (Blendon Information Services, November 2002).

In December 2000, General Chemical Canada Limited announced that its 500 000 t per year synthetic soda ash plant in Amherstburg would be placed on care and maintenance. The plant, one of only 2 synthetic facilities in North America ceased production in March 2001. The company reconfigured the calcium chloride plant at Amherstburg to run on brine shipped from Manistee, Michigan, resulting in suspension of production from the Anderdon Brine Field in early 2001.

In late 2002, The General Chemical Group Inc. of Hampton, New Hampshire, announced it would close its plant located in Manistee, Michigan, and consolidate calcium chloride operations at their plant at Amherstburg, Ontario. General Chemical said that it's Amherstburg facility's annual rated capacity of 450 000 flake equivalent tons is sufficient to meet all of the company's anticipated customer requirements for liquid and flake calcium chloride. Both the Manistee and Amherstburg plants have been using a brine feedstock supplied by a third party in Manistee; however, General Chemical said that it has now developed multiple feedstock sources from wells on site in Amherstburg and Manistee, as well as third party suppliers in southern Ontario. Two brine wells have been developed at Manistee, which will be used to supply the Amherstburg plant. The company has also developed a brine well at Amherstburg which, because it has been proven to be less economic, will be used as a back-up supply (Blendon Information Services, December 2002).

The salt extraction and processing industry employed approximately 775 southwest Ontario residents in 2002.

GYPSUM

In 2002, gypsum was mined at 2 locations in Ontario: at Caledonia by Georgia-Pacific Canada Inc. and at Hagersville by CGC Inc. Both operations have on-site wallboard manufacturing facilities. BPB Westroc Inc. operates a wallboard facility in Mississauga, Ontario, using flue gas desulphurization gypsum supplied by Ontario Power Generation and other sources. All gypsum mines and wallboard manufacturing operations are within the Southwest Ontario District (Figure 1).

Total gypsum extraction in 2002 was 964 000 t. This production level has been maintained for the past 3 years (Table 2). In Canada, particularly in southern Ontario, the demand for wallboard remains strong. This situation was documented in a March 2002 *Financial Post* article:

> The housing boom has created a drywall shortage that could mean delays for moving into new homes, says the president of a leading drywall manufacturer and supplier (James MacKay, of CGC Inc.). "It's going to be a tight market and we've told drywall contractors and home builders to prepare" said Mr. MacKay, who plans to hike prices by 10% next month. "It goes into everything. You can not build without it," said Mr. MacKay, whose firm shipped unprecedented levels of drywall over the past two months.

Canadian gypsum miners and wallboard manufacturers produced good economic numbers in 2002. The gypsum business of CGC Inc., a wholly owned USG subsidiary, increased its 2002 third quarter operating profit from US$6 million to US$7 million on a US$3 million increase in net sales to US$56 million. The improvement is attributed to higher shipments and pricing of joint treatment products and lower raw material costs (Blendon Information Services, November 2002). CGC Inc. is Ontario's largest miner of gypsum and manufacturer of drywall. BPB Westroc also enjoyed a robust construction market in 2001–2002 with the housing market continuing to benefit from lower interest rates. Westroc's domestic wallboard volumes grew nearly 9% and all of its 6 plants shipped product to the USA. Through acquisitions over the past year, BPB is the world's largest and North America's third largest wallboard producer (Blendon Information Services, March and June 2002).

In mid 2002, Georgia-Pacific Corp. announced it would split into 2 publicly traded companies. Partition of the Atlanta, Georgia, based company will occur along its principal business streams of its US$12 billion consumer products and packaging and its US$13 billion building products businesses. Through its building products business, Georgia-Pacific is North America's fourth largest wallboard producer with an approximate 10% market share (Blendon Information Services, April 2002).

Gypsum mines and on-site wallboard manufacturing plants employed approximately 540 southwest Ontario residents in 2002.

CEMENT

Five cement plants, 3 limestone quarries and 1shale quarry are located in the Southwest Ontario District. St. Marys Cement Inc. operates limestone quarry and cement plant complexes at Bowmanville and at St. Marys. Lafarge Canada Inc. operates a limestone quarry and cement plant near Woodstock. Along the Lake Ontario shoreline immediately west of Toronto is the St. Lawrence Cement Inc.'s Mississauga cement plant and adjacent shale quarry. Limestone is shipped to this plant from the Ogden Point limestone quarry in south-central Ontario. Federal White Cement Ltd. operates a specialized produc' cement plant near Woodstock; the limestone raw material is purchased from a local quarry.

Cement production levels remained high in 2002 due to the continuing good demand in the southern Ontario and US Great Lakes markets. Total cement production from Southwest Ontario District plants is estimated at over 4.6 million tonnes in 2002. This represents approximately 94% of production capacity (Natural Resources Canada, 2001).

In mid 2001, Votorantim Group purchased the Ontario cement assets formerly owned by Blue Circle under the name of St. Marys Cement Inc. Based in Sao Paulo, Brazil, Votorantim is that country's market leader for cement and one of the ten largest cement producers in the world. It operates 16 cement plants, with an annual global production capacity of 25 million t per year. Votorantim Group, one of the largest private industrial conglomerates in Brazil, continues to operate its Ontario plants under the St. Marys Cement Inc. name. St. Marys Cement Inc. holds 10% of the Canadian cement market. Votorantim spent 2002 analyzing the St. Marys Cement operations. The company stated in its 2001 Annual Report that it would spend $60 million in the immediate future to modernize the Canadian subsidiary (Votorantim Group, Annual Report 2001).

In October 2002, Lafarge North America, parent company of Lafarge Canada Inc., reported that net income, compared to the pervious year, rose 9% as pricing gains in most product lines and better cost performance in the company's manufacturing facilities offset the impact of a weaker construction environment. Operating results in the company's cement segment improved by 8% to US$139.9 million despite a 1% decline in cement sales volumes (*Aggregates & Roadbuilding*, November 2002).

Early in 2002, St. Lawrence Cement Inc. reported a strong improvement in 2001 financial results, highlighted by a 28.3% increase in net earnings to $62.2 million. Sales climbed 12.6% to $1.2 billion, reflecting steady demand and firmer cement prices and driven by a high level of activity in Ontario. Later in the year, St. Lawrence Cement Inc. reported its cement plants were operating at high capacity and it is benefiting from additional volume from the recently acquired quarry at Acton, Ontario (*Financial Post*, February 2002).

Cement quarries and plants employed approximately 640 southwest Ontario residents in 2002.

CLAY / SHALE PRODUCTS

In 2002, 4 companies extracted shale from 6 quarries in southwest Ontario for heavy clay products. The shale supplied 7 brick and tile manufacturing operations within the District. In 2002, approximately 1.28 million t of shale was extracted to produce over 700 million standard brick equivalent units at plants within the Southwest Ontario District. This is an increase in brick production of approximately 11% over the previous year, and almost a 30% increase over a two-year period. Southwest Ontario contributes 95% of Ontario's brick production.

The increased production reflects recent new investments to increase manufacturing capacity, which were driven by the strong demand for brick particularly in residential construction market in southern Ontario. Demand for brick products is very strong across North America.

Two large operators, Hanson Canada Brick and Brampton Brick, have both quarrying and manufacturing facilities. One smaller operator, Century Brick, also has both quarrying and manufacturing facilities. These 3 companies extract Queenston shale in the area between north Brampton and Hamilton. A small quarry operated by George Coultis & Son Ltd. near Thedford, Ontario, supplied shale to Paisley Brick and Tile Co. and Norwich Brick and Tile. Arkona Formation shale forms the resource rock at the Thedford Quarry.

In June 2001, Brampton Brick opened its expanded manufacturing facility in northwest Brampton. The plant is the single largest clay brick producing facility of its kind in North America. In late 2002, Brampton Brick reported that the large number of housing starts and the additional production provided by the new third kiln line has allowed brick shipments to increase approximately 19% over last year's levels. The company also indicated that gross margins have also improved as a result of the combined effects of lower manufacturing cost per unit and slightly higher selling prices. The lower manufacturing costs resulted from higher output from the new production line which produced economies of scale, and the decreased cost of natural gas, which is one of the largest components of manufacturing costs. Brampton Brick will invest several million dollars in rebuilding and upgrading equipment at its manufacturing plant in 2003 (Brampton Brick Ltd., Annual Report 2001).

In May 2002, Ontario's newest mineral extraction site and processing plant, Hanson Canada Brick's Aldershot quarry and brick plant were officially opened. The $60 million plant, one of the most sophisticated in North America, uses 4 industrial robots. In its first year it produced over 160 million brick units or enough bricks to build 10 000 new homes. The opening was reported in Toronto area media, including the *Toronto Star, Toronto Sun,* and *Homes Magazine,* under the following banners: "Burlington Plant uses new tricks for old art", "Aldershot brick superplant officially opens", and "Solid as a brick – Ontario builders have been creating beautiful brick homes for generations". Care went into the design and construction of the new factory, including the grading of the site to ensure that the plant cannot be seen from the nearby Highway 403. The plant's location is directly beside the quarry where 125 t per hour of Queenston shale are extracted. At current brick manufacturing rates, the quarry contains resource to meet the factory's needs for the next 40 years. A limestone scrubbing system and recycling techniques minimize waste and assure that the plant meets the highest environmental standards and government regulations.

Throughout 2002, the westward urban expansion of greater Toronto continued to sterilize large areas of the remaining Queenston shale resource. This continues to be a major issue for the long-term viability of the brick making industry in Ontario. Rezoning for urban development during 2002 occurred in north Oakville and northwest Brampton. In the Oakville area, Hanson Canada Brick operates a shale quarry and 2 brick plants in the area immediately west of recently rezoned lands.

Shale quarries and brickmaking plants employed approximately 400 southwest Ontario residents in 2002.

CHEMICAL, METALLURGICAL AND FILLER LIMESTONE AND DOLOSTONE PRODUCTS

Except for a small amount of production in northern Ontario that utilizes imported materials, Ontario's lime industry is situated in the Southwest Ontario District. Within the District in 2002, 3 quarrying operations extracted limestone or dolostone for use in the lime, chemical, metallurgical and filler products industries. Some of these and other quarrying operations also sell material for aglime, aggregate, landscaping and engineering uses. Carmeuse Lime (Beachville) Ltd., located between Woodstock and Ingersoll, produces high-calcium lime from Devonian Lucas Formation limestone. Carmeuse Lime (Dundas) Ltd. produces dolomitic lime or dolime from Silurian Guelph Formation rock purchased from the adjacent Dundas Quarry of Lafarge Canada Inc. This quarry is one of only 3 producers of refractory grade dolomite in North America. E.C. King Contracting extracts glass-grade dolostone from the Silurian Amabel Formation at the Sydenham Quarry near Owen Sound.

Lime and dolime production has been reduced over the past several years due to less demand for product from the steel making industry. The reduction has been less in Canada than in the United States. The continued slump is noted by Carmeuse North America of Pittsburgh, Pennsylvania, the parent company of Carmeuse Lime (Beachville and Dundas), which reported a 7% reduction in lime sales for the first half of 2002 compared to the same period in 2001. This reflected the downturn in lime demand from the steel industry as well as the effect of a mild spring and unexpected power outages at certain utilities, which reduced demand for flue gas desulfurization (FGD) (Blendon Information Services, November 2002).

Though the steel industry is still the dominant market for high purity limestone and dolostone products, sales into other markets and uses are gaining ground. Flat glass use is growing above general economic growth rates as a result of strong construction and automotive markets; therefore, float glass plants and projects represent attractive potential for raw dolostone.

Ground calcium carbonate (GCC) is one of the most widely used industrial minerals for a number of applications due to characteristics such as widespread availability, low cost, good (white) colour, low oil absorption, and a wide range of particle sizes. It has become an increasingly important functional additive in product formulations as processing techniques have improved its quality. In North America, the construction and automotive markets drive the functional filler industry. Carmeuse Lime (Beachville) Ltd. produces GCC and lime used in various industries including paper, plastics, and rubber, as well as chemical, construction, fertilizers, glass and metallurgy.

The investment in flue gas desulfurization (FGD) technologies to remove SO_2 from power plant exhausts is already sizeable in the United States and is expected to rise significantly. It is estimated that power plant operators in North America will order FGD systems, costing over US $30 billion, in the next 8 years. As a result, requirements for limestone, lime and other reagents will steadily increase. The bulk of the systems in operation and those built in the future will use high-purity limestone. Worldwide consumption of limestone and lime for FGD is forecast to exceed 40 million t per year by 2010. The FDG market represents an important strategic focus for limestone and lime producers in Ontario (*Industrial Minerals*, November 2002).

Operations at Carmeuse Lime (Beachville) Ltd. were highlighted in May–June 2002 edition of *Aggregates & Roadbuilding*. A unique feature of this operation is that the valuable limestone deposit is covered by up to 25 m of overburden as well as a layer of weathered cap rock. Each year about 750 000 m^3 of overburden has to be moved to allow a similar volume of rock to be mined. This one-to-one ratio would be prohibitively expensive in many situations, but at Beachville the stripping process incorporates the extraction of commercial quantities of sand, gravel and armour stone. Stripping continues until a 1.5 m bench of thinly bedded cap rock overlying the main limestone bench is exposed. The high silica content of the cap rock rules out its use in metallurgical applications, but it is in strong demand for construction applications such as decorative landscaping, retaining walls and erosion control, with annual production exceeding 200 000 t.

Quarries extracting limestone or dolostone for use in the lime, chemical, metallurgical and filler products, and associated on-site processing plants, employed approximately 190 southwest Ontario residents in 2002.

DIMENSION / BUILDING STONE

In 2002, in the Southwest Ontario District, materials for dimension, building and landscape stone uses were extracted from 24 quarries operated by 18 companies. A limited number of these quarries also extracted stone that was crushed and used as aggregate. Three newly developed quarries reached significant production levels in 2002: the Wiarton Quarry of Bruce Peninsula Stone Ltd., the Wiarton Quarry of Eisen Quarries Inc. and the Rockleith Quarry. The 2 Wiarton quarries are extracting Eramosa Member dolostone. The Rockleith Quarry extracts Gull River Formation limestone from northwest of Orillia.

Quarries extracting limestone, dolostone, sandstone and gneiss for dimension, building and landscape stone use, and associated on-site processing plants, employed approximately 455 southwest Ontario residents in 2002, including 410 in the Owen Sound–Wiarton area (personal communication with all quarry owner/operators, 2002–2003).

Most stone quarry operators indicated that the demand for stone outstripped supply in 2002, particularly those supplying Eramosa Member dolostone ("marble") and Whirlpool Formation sandstone as landscape materials. Many of these operators reported 2002 as a "good" or "the best" year, with most indicating a strong market that will probably continue into 2003. In 2002, stone producers purchased an estimated $4 to 5 million in new extraction and processing equipment. Many indicated plans to increase production and to set-up new processing equipment in 2003. The primary market for stone is southern Ontario, the secondary market is the Great Lakes region of Canada and the United States, with a limited amount being shipped farther afield.

Wiarton Area Quarries

The largest concentration of stone producers in the Southwest Ontario District is in the Wiarton area where 13 operations extracted Eramosa Member dolostone for building stone, landscaping and flag stone markets, and 2 operations quarried other stone types.

OWEN SOUND LEDGEROCK LIMITED

Owen Sound Ledgerock Ltd., the largest stone quarrying and processing operation in the Southwest Ontario District and in Ontario, cut and polished Eramosa material for dimension and building stone uses utilizing over 100 large format stone cutting machines.

In 2002, Owen Sound Ledgerock developed a new quarry—the Silverwater limestone Quarry—via a business agreement for the exclusive right to extract stone from the established Silverwater quarry in Robinson Township, Manitoulin Island. The dolomite found in this quarry is a non-fading, medium grey-coloured stone that produces large blocks for "marble", wall stone, landscape stone and architectural cut stone. This stone can be processed into a variety of finishes and textures, including polished, honed, sandblasted, bush hammered and smooth sanded.

Continuing in 2002, was the fifth year of a pending quarry expansion licence for the company's primary production quarry at Wiarton. A cycle of forestallment and inactivity by municipal councils and government bureaucracy has resulted in Owen Sound Ledgerock deciding to pursue business opportunities outside the Wiarton area. The company has ongoing discussions with other quarries in Ontario for good-quality limestone block materials. In addition to Silverwater, Owen Sound Ledgerock developed products from 2 other new stone types in 2002: the Artesia Marble, quarried locally near Owen Sound, and the Rama Marble, quarried in the Orillia area.

The company continues to import blocks for processing from outside of Ontario. In 2002, Owen Sound Ledgerock purchased more than $1.2 million worth of raw limestone blocks from Indiana state quarries. Many large Indiana limestone residences were completed, including one 34 000 square foot residence in the United States. This large home was clad with stone on the exterior, interior and used extensively throughout the landscaping. Owen Sound Ledgerock has shifted more of its attention to the Indiana cut stone markets domestically and in the United States, a decisive market departure from processing locally quarried cut stone. Recent Ontario examples of Indiana limestone use are the Magna Corporation Golf Course Club House in Aurora, and the Grand River Cancer Centre in Kitchener.

Two large construction projects in Toronto during 2002 highlight Owen Sound Ledgerock's diverse capabilities. Using red sandstone imported from Great Britain, company craftsmen restored masonry and produced new stone carvings at Toronto Old City Hall. The new Schulage Building at York University was designed with abundant use of Algonquin Limestone.

In 2002, Owen Sound Ledgerock started a major upgrade to processing equipment. The company has opened a new business line with a newly acquired Terzzago tile line purchased from Italy. A large dome building has been erected on the Owen Sound property with marble tile line installed along one side of the building and a sandblast and new

bush hammering line on the other side of the building. The new facility will be fully operational in June 2003 with marketing plans for processing stone types from other regions of Ontario.

Owen Sound Ledgerock reports that the business saw continued growth in 2002, with contracts secured well into the latter half of 2003. The Company has strengthened its cut stone position in the market and looks forward to expanding markets in 2003. The marking plan includes using the newly designed website—ledgerock.com—unveiled in late 2002, and building on contacts made at StonExpo 2002 (all information, S. McCallum, Owen Sound Ledgerock Ltd., personal communication, February 2003).

OTHER WIARTON AREA QUARRIES

Ebel Quarries Inc. at the Ebel Quarry extracted quarry blocks from the Eramosa Member of the Guelph Formation, in addition to Eramosa Member material for building and landscape stone products. The company's Arnold Property Quarry continued in development and limited production mode in 2002. All other Eramosa Member producers supplied building and landscape stone products. The Wiarton Quarry of Eisen Quarries Inc., which started production this year, is expecting a significant increase in production and processing capability in 2003. The Emerson McLay Quarry located north of Wiarton, which suspended operations in June 2000, will resume operations in 2003 under the name of Limberlost Stone Inc.

Bruce Peninsula Stone Ltd., at the Lindsay Quarry on the northern portion of the Bruce Peninsula, extracted Guelph Formation dolostone for supplying building and landscape stone products.

Arriscraft International Inc. operated the Adair Marble Quarry just north of Wiarton. Blocks of the Wiarton/Colpoy Bay Member of the Amabel Formation are extracted and either processed on-site or transported to contractors processing plants across southern Ontario. Major 2002 Ontario projects using Adair Marble include renovations to Ottawa airport and the new chemistry building at Queen's University.

Sandstone Quarries

In the Georgetown–Inglewood area, white and maroon Whirlpool Formation sandstone was extracted at the Rice & McHarg, Hilltop Stone and Supply, and Deforest Brothers quarries for the production of squared and irregularly shaped landscaping stone.

Orillia Area Quarries

In the Orillia area, Gull River Formation limestone was extracted for sale as building and landscape stone by 4 separate companies, Rockleith Quarry Ltd., Speiran Quarries Ltd., Cut Above Natural Stone, and Stone Cottage Inn Ltd. At the Rama Stone Quarries Ltd. property, Fowler Construction quarried gneiss for landscape stone, and crushed for premium-quality and speciality aggregate. In 2002 and continuing into 2003, Rockleith Quarries Ltd. and Stone Cottage Inn Ltd. explored for and test-marketed new stone products.

AGGREGATE

Crushed stone aggregate is a major mineral commodity produced in southwest Ontario. In July/August 2002, *Aggregates & Roadbuilding* published their annual listing of Canada's top 20 stone quarries. For 2001, 9 of Canada's top 20 quarries are located in Ontario, including 4 of the top 5. Eight of the 9 Ontario quarries on the list, the only exception being the Manitoulin Quarry, are within the Southwest Ontario District. All are primarily aggregate quarries with the exception of the Ingersoll Quarry, which supplies high-purity limestone for the chemical industry. The Ontario quarries, showing ranking and 2001 production, are:

Rank	Operation	2001 Production (million t)
1.	Milton Quarry—Dufferin Aggregates	5.92
2.	Manitoulin Quarry—Lafarge Canada	5.0
3.	Dundas Quarry—Lafarge Canada	4.80
5.	Acton Quarry—Dufferin Aggregates	3.47
11.	Burlington Quarry—Nelson Aggregate	1.89
12.	Ingersoll Quarry—Carmeuse North America	1.86
13.	Brechin Quarry—Lafarge Canada	1.53
16.	Amherstburg Quarry—Amherst Quarries	1.36
18.	McGregor Quarry—Amherst Quarries	1.24

The major crushed stone source areas are along the Niagara Escarpment (particularly in the Milton area), east of Lake Simcoe, in the Port Colborne area and south of Windsor. Most of the crushed aggregate is trucked to local major urban centres.

Sand and gravel is also a major mineral commodity produced in southwest Ontario. In the September/October 2002 issue, *Aggregates & Roadbuilding* published their annual listing of the Canada's top 20 sand and gravel operations. All 9 Ontario representatives in the list are within Southwest Ontario District and within 80 km of downtown Toronto.

Rank	Operation	2001 Production (million t)	Geological Unit
2.	Lafarge Canada, Mosport Pit	3.05	Oak Ridges Moraine
6.	CBM Aggregates, Aberfoyle Pit	1.5	Aberfoyle outwash spillway
7.	James Dick Construction, Caledon Pit	1.49	Caledon outwash channel
8.	Lafarge Canada, Stouffville Pit	1.39	Oak Ridges Moraine
10.	Dufferin Aggregates, Mosport Pit	1.2	Oak Ridges Moraine
11.	Dufferin Aggregates, Mill Creek Pit	1.15	Aberfoyle outwash spillway
16.	Lafarge Canada, Caledon Pit	0.99	Caledon outwash channel
17.	CBM Aggregates, Sunderland Pit	0.96	Sunderland esker
20.	Dufferin Aggregates, Aberfoyle Pit	0.75	Aberfoyle outwash spillway

The major sand and gravel source areas include along the Oak Ridges Moraine, and outwash deposits within Caledon and Puslinch townships, and between Cambridge and Brantford. Most of the material is trucked to local major urban centres.

ADVANCED EXPLORATION AND DEVELOPMENT

Dimension/Landscape Stone

In addition to the continued development of the Arnold Property Quarry of Ebel Quarries Inc., several dimension/building stone projects have started the licensing process under the Aggregate Resources Act. For reasons of legal privacy and confidentiality, the companies and individuals working on these projects and their exact locations cannot be identified. The projects include limestone quarries in Rama and Orillia township, 4 applications for new licenses to quarry Eramosa Member dolostone ("marble") in Keppel, Albemarle and Amabel townships, and 2 applications for new licenses to quarry dolostone in Lindsay and Albemarle townships. These applications and projects are at varying stages within the process.

Cement Stone

In 2002, there was an ongoing process to expand the aggregate license of Federal White Cement Limited in Zorra Township. To date, Federal White Cement has not extracted stone from their licensed property. Stone to feed their Woodstock plant is purchased from local quarries.

Greenock High-Calcium Limestone Quarry

In August 2002, Fortune Minerals Limited/Formosa Environmental Aggregates Ltd. updated the status of their Formosa High-Calcium Chemical Limestone Quarry project. Formosa owns 107 hectares in the Municipality of Brockton in South Bruce County. Patch reefs within the Amherstburg Formation underlie the property. Formosa intends to develop the Greenock Quarry on its property to mine a 15 million t resource, grading 99% calcium carbonate. It is suitable for use in a number of chemical, industrial, environmental, agricultural and construction materials markets. The company had received all the requisite official Plan and Zoning amendments and was waiting for approval from the Ministry of Natural Resources (MNR) for an Aggregate License. The Company expects to receive this license shortly and bring the property into commercial production (R. Goad, Fortune Minerals Limited, personal communication, August 2002).

As of January 2003, discussions between Fortune Minerals Limited/Formosa Environmental Aggregates Ltd. and MNR continue and no license has been issued.

EXPLORATION ACTIVITY

All exploration activity in the Southwest Ontario District occurs on private land and there is no requirement for companies or individuals conducting mineral exploration to file assessment reports with the Ministry of Northern Development and Mines or to contact the Southwest Ontario District Geologist Office. Through informal discussions and research, however, staff of the Southwest Ontario District Geologist Office acquire information on most property acquisition interests or exploration projects for such commodities as: high-purity limestone/dolostone, salt, gypsum, sandstone, limestone/dolostone/marble, dimension/building stone, cement, shale and zinc.

Numerous companies and individuals contacted the Southwest Ontario District Geologist Office throughout 2002 for information and/or advice with respect to exploration areas, commodities, exploration methods, processes for acquiring mineral properties and exploration opportunities. Confidentiality and private land issues surrounding the competitive and market-driven nature of the industrial minerals industry impedes disclosing the identities of companies and/or individuals exploring in southwest Ontario and/or the locations of their properties. However, most exploration centres on the commodities that are currently experiencing strong market conditions, including aggregate, dimension/building stone, shale/brick, limestone and dolostone.

Exploration projects conducted across the Southwest Ontario District included such activities as trenching, at least 80 drill holes of varying length, geochemical analyses, and physical and ceramic testing. Exploration costs, excluding the acquisition of surface and/or mineral rights, are estimated at over $1 million.

One exploration company has formally released information to the public concerning its activities; ONTZINC Corporation reported, in September 2002, on its exploration project for Mississippi Valley-type zinc mineralization in the Stratford, Listowel, and Harriston areas of southwestern Ontario. Geochemical and geophysical exploration work completed to that date, using MMI technology and QUANTEC TITAN 24 technology, respectively, had defined 24 anomalies and suggested the presence of a district-sized exploration target. ONTZINC had acquired mineral leases on 3700 hectares in the area. The company anticipated that by late 2002 it would have completed sufficient target land acquisitions to proceed with exploration drilling. The company has budgeted for the drilling of 100 holes to provide initial test holes through the 24 anomalies that have been outlined. The estimated cost of the

Southwestern Ontario exploration program, as defined, will be $3.5 million (P. George, ONTZINC Corporation, personal communication, January 2003, and ONTZINC Corporation, press release, September 2002).

RESIDENT GEOLOGIST PROGRAM STAFF AND ACTIVITIES

The Southwest Ontario District Geologist Office, staffed by the District Geologist and the District Support Geologist, operates from the Mines and Minerals Information Centre (MMIC) in Toronto. All files, mineral deposit records and reference materials for the Southwest Ontario District are available for viewing at MMIC. In 2002, the District Geologist was Ken Steele. Throughout 2002, Max Barua was the acting District Support Geologist until he assumed the position on a permanent basis at the end of the year.

During 2002, Southwest Ontario District staff assisted approximately 1120 clients who visited or contacted the District office, as well as dialogued with an estimated additional 2500 clients at various conferences and trade shows. Staff responded to a wide variety of inquires, the most frequent requests being for information focused on the following southern Ontario commodities and topics:

- aggregate, coloured aggregate, sand and gravel, limestone, dolostone, high-purity limestone, high purity dolostone, calcium carbonate (PCC and GCC), lime, cement, building/dimension/landscape stone, sandstone, marble, Queenston Limestone, Eramosa Marble, gypsum, salt, shale/brick, clay, high-purity silica, silica sand, lead/zinc, filler minerals, basalt, wollastonite, nepheline syenite, mica, vermiculite, trap rock, peat, granite, kimberlites and/or diamonds, chert, groundwater, quartz, feldspar
- petroleum royalties, surface and mineral rights, exploration on private land, Mining Act, Aggregates Resources Act, quarrying techniques, drilling regulations and techniques, drill hole records, blasting rules and regulations, geophysical surveys, geochemical sampling, oil and gas potential, property evaluations, drift thickness, Abandoned Mines database, fossils, Aggregate Producers Association of Ontario
- Trafalgar Moraine, Oak Ridges Moraine, Niagara Escarpment, Scarborough Bluffs, Bruce Peninsula

Property Examinations/Company Contacts

In 2002, site visits conducted by Southwest Ontario District staff focused on the following 5 topic areas:

- to acquire information from mineral industry operations who produce commodities that are currently in high demand, have potential for higher demand in the near future, and/or have production or marketing issues;
- to visit prospective, proposed or developing mineral properties;
- to investigate mineral sites with current or potential land-use conflicts;
- to acquire information for subsequent field trip visits;
- to obtain information to update records contained within the Mineral Deposit Inventory (MDI) database.

There are 44 industrial mineral and dimension stone operations and approximately 40 aggregate quarries active in the Southwest Ontario District. During 2002, the District Geologist made contact with all industrial mineral and dimension stone producers. The District Geologist and/or District Support Geologist visited 22 quarries or mineral extraction sites, mineral processing plants, mineral distribution and/or marketing locations, development sites and prospects across the Southwest Ontario District (Table 3). Site visits provided information on commodities, mineral deposits, local and regional geology, extraction techniques, processing, products, markets, production and economic statistics and issues.

The District Geologist was provided a comprehensive geology and/or plant tour at:

- Ciot Marble and Granite Inc. – Maple, ON – supplier and importer of granite, marble and limestone slabs, including several Ontario varieties
- John Eisen Ltd. – Fergus, ON – dealer of natural stone landscape products, including over 20 Ontario stone products
- Hilltop Stone and Supply Inc. – Georgetown, ON - Credit Valley Sandstone
- Roxul Inc. – Milton, ON – producer of mineral wool insulation
- Hanson Canada Brick – Aldershot shale quarry and brick plant
- Dufferin Aggregates – Milton Quarry – dolostone/aggregates
- Owen Sound Ledgerock Ltd. – Owen Sound plant – dimension/building stone

The District Geologist collected samples at, or made brief visits to, the following operations:

- Hanson Canada Brick – Burlington Quarry – shale
- Unimin Canada Ltd.– Midland Plant – quartzite
- Dufferin Aggregates – Milton Quarry – dolostone/aggregate
- Carmeuse Lime (Beachville) Ltd. – Beachville Quarry – limestone
- Beaver Valley Stone Ltd. – Thornhill, ON – distributor of a wide variety of Ontario landscape stone products
- Fowler Construction/Rama Stone – Longford & Rama Quarries – gneiss
- Rice & McHarg Quarries Ltd. – Georgetown, ON – Credit Valley Sandstone
- CGC Inc. – Hagersville Mine – gypsum
- Hanson Canada Brick – Milton Quarry – shale
- Zn occurrence, Guelph Formation – Keppel Tp.
- A & A Natural Stone Quarry – Keppel Tp. – building stone
- Georgian Bay Marble & Stone Quarry – Amabel Tp. – building stone
- Eisen Quarries Incorporated – Wiarton Quarry, Amabel Tp. – building stone
- Bruce Peninsula Stone – Wiarton Quarry, Amabel Tp. – building stone
- Arriscraft International – Adair Marble Quarry, Ablemarble Tp. – dimension stone

Outside of the Southwest Ontario District, the District Geologist was provided visits and/or tours at the following 6 sites in the Southeast Ontario District:

- Senator Stone – Elzevir Quarry – marble
- Cameco Corporation Uranium Refining and Conversion Facility – Port Hope
- ESSROC Canada Inc. (Italcementi Group) – Picton Quarry – cement
- Canadian Wollastonite – St. Lawrence wollastonite deposit, Pittsburgh Tp.
- Palu-Corbelli Corporation – granite deposit, Sheffield Tp.
- Graphite Mountain Inc. – graphite deposit, Bedford Tp.

Mine, quarry, property and site visits are all part of the Resident Geologist Program's ongoing responsibilities to monitor current mineral activities, to document known mineral deposits and occurrences, and to identify areas of high mineral potential. Site visits also provide useful information for application to land use planning processes.

Mineral Deposit Inventory (MDI)

In 2002, staff continued updating the mineral deposit inventory (MDI) files for the Southwest Ontario District. By the year-end, the District Support Geologist (DSG) had revised 106 records, and created 20 new records. As part of this process, all records for the commodity gypsum were reviewed and updated. At the end of 2002, the MDI database contained 679 records for the Southwest Ontario District.

In 2002, the DSG successfully completed the transfer of MDI records in Matchedash, Rama and Clarke townships into the Southwest Ontario District. The former two townships had previously been within the Sudbury District and the later in the Southeast Ontario District.

Industry Interaction

District staff participated in a number of industry organizations, field trips, publications, conferences, trade shows and meetings in 2002.

In January, the District Geologist joined the Executive Committee of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Toronto Branch. The District Geologist continued to participate on the Prospectors and Developers Association of Canada (PDAC) Education Committee.

In May, the District Geologist, in cooperation with Regional Resident Geologist for Southern Ontario, completed basic planning for a joint CIM Toronto Branch and CIM Industrial Minerals Division field trip. The preliminary announcement for the trip on Monday, October 21, 2002, titled "Ontario's Eastern Frontier – uranium, diamonds & cement" was circulated.

In August, the District Geologist met with the president of the Aggregate Producers Association of Ontario to discuss the noncrushed stone and sand and gravel industries licensed under the Aggregates Resources Act; these include building stone, shale/brick, cement and lime/dolime producers.

In September, the District Geologist wrote 2 articles for a planned Toronto supplement to the Mining Journal. The expected publication date is early 2003. The articles focused on the geology of and industrial mineral industries in the Toronto region.

In October, the District Geologist participated in the Ontario Mining Association's "Meet the Miner" reception at the Ontario legislature. The mining industry of Southwest Ontario was well represented, as the mine managers from both of the salt mines were in attendance. James Vincent, manager of The Canadian Salt Company Ltd.'s Ojibway Mine at Windsor, was recently installed as the Chairman of the OMA.

On October 21st, all Resident Geologist Program staff for the Southwest Ontario District and Southeast Ontario District offices organized and presented the field trip **"Ontario's Eastern Frontier - uranium, diamonds & cement"** for the CIM Toronto Branch and CIM Industrial Minerals Division. The trip was sold out with over 50 attendees coming from a variety of locations, including Toronto, Winnipeg, Sudbury, Quebec City, Ottawa, New York and London, England. Attendees represented a wide cross-section of the mineral sector and related disciplines, including industrial minerals, government, associations, exploration consultants, universities, development and mining consultants, finance groups and the press. Among the participants were 2 groups consisting of 9 staff from the PDAC office and 5 students from the University of Toronto Lassonde Mineral Engineering program.

The field trip visited:

- Cameco Corporation Uranium Refining and Conversion Facility – Port Hope
- ESSROC Canada Inc. (Italcementi Group) – Picton Quarry
- Kimberlite Dike exposed within the Picton Quarry
- Lake on the Mountain – a geological curiosity

The trip was sponsored by:

- CGC Inc.
- Goldcorp Inc.
- Macleod Dixon LLP
- Overburden Drilling Management Ltd.

- P.R. Engineering Ltd.
- Secoroc
- Unimin Canada Ltd.
- Watts, Griffis and McOuat Ltd.
- Ministry of Northern Development and Mines

Trip highlights included insights on the nuclear power industry during the Cameco tour, watching a blast at the ESSROC Picton Quarry, collecting kimberlite samples, debating geological theories concerning the genesis of Lake on the Mountain near Picton, and meeting old and new friends over dinner at the Waring House Inn. Special thanks are extended to field trip hosts and sponsors. The field trip raised over $2000 for CIM educational projects.

The field trip was reviewed, and a picture inserted in the *CIM Bulletin*, Volume 95 – November/December 2002.

In November, the District Support Geologist attended the dedication of large rocks presented to the University of Toronto Geology Department by various donors and a related talk by Ed Freeman. These interesting boulder-size rock specimens with identification and descriptions are placed around the geology building at the university.

Conferences and Meetings

In January, the District Geologist attended a meeting of the "Data modeling working group for MNDM aquifer mapping". The session included presentations on oil and gas, geotechnical and groundwater drilling databases.

At the **PDAC Annual Convention** on March 10 to 13 in Toronto, staff of the Resident Geologist Program for southern Ontario presented a display titled "Southern Ontario – Explore the Opportunities" within the Ontario Pavilion. The display was created by the Southwest Ontario District Geologist and staffed by the Regional Resident Geologist for Southern Ontario, the District Geologists for Southwest Ontario and Southeast Ontario, and the District Support Geologist Southeast Ontario.

On the display, under the subheader "Mineral Producers" was a map with 83 non-aggregate mineral producers and 16 selected exploration and development projects.

Under the subheader "Recommendations for Exploration", the 7 commodities listed below and representative rock samples were highlighted.

- Gull River Formation limestone dimension stone and landscape stone
- Eramosa Member dimension and landscape stone
- Queenston Formation shale
- Guelph Formation dolostone
- Flinton Group quartz pebble conglomerate dimension stone
- Mineral fillers and extenders
- Pegmatite resources of Southeastern Ontario

The display also highlighted "Did you know? Southern Ontario mineral and mining facts"; including

- In Southwest Ontario District, 3000 people are employed at industrial mineral mines, quarries and on-site processing plants. Employee totals by industry/commodity include: salt operations – 808; cement operations – 625; brick industry operations – 489; gypsum operations – 440; and building stone operations – 426. These totals do not include the largest aggregate industry in the country.
- In 1819, Ontario's first underground mining operation extracted gypsum from adits along the Grand River at Paris. Today, 2 underground gypsum mines operate in the Grand River region, at Caledonia and Hagersville.

- The first production of salt in Ontario occurred in 1866 from a well drilled at Goderich in search of oil. Today, Sifto Canada operates the world's largest underground salt mine, a brine field and evaporator plant at Goderich.
- Ontario's $134 million brick/shale industry is operating at capacity, producing over 700 million bricks annually. In 2000–2001, the industry invested over $85 million in new and upgraded plants. Brampton Brick's plant, with the capacity to manufacture 200 million bricks per year, is now the largest production facility in North America. Canada Brick's new Aldershot brick quarry and manufacturing plant, which produced its first bricks in June 2001, is Ontario's newest mine.
- The largest concentration of dimension, building and landscape stone quarries in the province is at Wiarton. Eramosa Member dolostone/marble, Ontario's most recognized building stone, is currently extracted from 10 quarries in the area.
- The Ontario Legislature and the Royal Ontario Museum in Toronto, the Parliament Buildings in Ottawa, and the Canadian Embassy in Washington are all constructed of southern Ontario stone.

In October, the District Geologist prepared and staffed an MNDM "Industrial Minerals" display at the **14th Annual Canadian Conference on Markets for Industrial Minerals** in Toronto. The conference had over 100 delegates from across North America. The display was popular and the rock and mineral samples prompted much discussion concerning Ontario's producers, deposits, geology, exploration projects and potential. Conference proceedings are available for viewing at the MMIC.

The District Geologist attended the **Ontario-New York Oil and Gas Conference**, November 4 to 6, 2002, at Niagara Falls, Ontario. The conference was co-sponsored by the Ontario Petroleum Institute. The District Geologist participated in the Geological Field Trip of the Niagara Wine Region. The field trip guidebook is available for viewing at the MMIC. Technical session presentations included reviews of current exploration potential and exploration and development activities in Ontario, Quebec and New York State, and overviews of current production in Ontario. The keynote speaker, Dr. Ted Bogle, V-P Exploration, for Talisman Energy Inc., presented "Ontario Oil and Gas 145 years later – An International Producers Prospective".

In December, the District Support Geologist attended a meeting of MNDM Regional Support Geologists, District Support Geologists and Regional Land Use Geologists from across the province in Toronto.

The District Support Geologist attended and provided logistical support to the Ontario Prospectors Association's **"Ontario Exploration and Geoscience Symposium"** in Toronto, December 2 to 4. He assisted in the presentation of 2 posters titled "Southern Ontario Exploration Opportunities" and "Ontario's Industrial Minerals " in collaboration with the staff of Southeast Ontario District office.

MNDM coordinated an "Ontario Stone" partnership display at **StonExpo 2002** on December 5–7 in Baltimore, Maryland. Attending for the MNDM were Ken Steele, Southwest Ontario District Geologist, and Myra Gerow, Commodities Coordinator, Mines Group.

The partnership of 5 Ontario stone producers and the MNDM occupied a 20 by 20-foot area immediately inside the main entrance to the trade show. The 5 stone producers promoted their stone products and services via display boards, table displays, rock samples, carousel of stone tiles and computer presentations. MNDM presented approximately 40 stone samples representing most current Ontario producers and a number of development or investment opportunities.

Partners and attendees included:

- McLaren's Bay Mica Stone Quarries, Redbridge – Wayne Borer, George Boughner Jr., Bill Rhode, Jan Rhode
- Owen Sound Ledgerock Limited, Owen Sound and Wiarton – Steve McCallum, Andrew Negus, Tom Stobbe

- StoneAge Lighting, Dundas – Carl Christiansen
- Attia Quarry – Stone Cottage Inn Ltd., Orillia – Eid Attia, Sonia Attia
- Jeff Parnell Contracting Ltd., Bobcaygeon – John Pate

The Ontario Stone booth was one of the busiest at the trade show. All partners, including the MNDM, entertained many serious business leads and contacts that were followed up after the show. The partners received numerous positive comments from show attendees on the partnership format, as an excellent co-operative venture between companies and government. MNDM staff received many inquiries with respect to quarrying opportunities, particularly for properties with past production that might be for sale or partnership, and for stone types that are currently in demand including slate, grey limestone, buff limestone, and black granite. It is estimated that over 3000 show attendees interacted with various members of the Ontario partners delegation.

The District Geologist provided logistical and geological support to the 3 partners from southwest Ontario, as well as promoted southwest Ontario and Ontario stone producers and opportunities. As a result of contacts made at the show, it is anticipated that a number of individuals and companies will explore for and/or investigate limestone and building stone resources in the Southwest Ontario District in 2003.

Land Use Planning

The District Geologist and District Support Geologist were involved in a number of land use planning initiatives that required Ministry input throughout the year.

The District Geologist attended a two-day Provincially Significant Mineral Potential (PSMP) training session in Tweed and interministry training on the Oak Ridges Moraine Conservation Act & Plan.

The District Geologist participated in the final meeting of the Brampton Urban Boundary Review Shale Resources Steering Committee, where "Phase 2 Drilling, Sampling and Quality Testing of the Queenston Shale" report was presented and recommendations discussed. In August, the District Geologist received from, and provided comments back to, the City of Brampton on "Shale Resources Review Final Report". For approximately 2 years, the District Geologist has been an advisor in a process to further delineate and designate, for potential future extraction, shale resources in the northwest Brampton area.

In October, the District Geologist prepared and presented "MNDM Role in Aggregates and Planning" to the Ministry of Municipal Affairs and Housing Provincial Planning Managers. The talk was part of a three-part session on aggregate issues, with other presentations from MNR and the Aggregate Producers Association of Ontario.

Throughout the year, Southwest Ontario District staff dealt with a variety of land use planning topics. These included past gypsum mining operations in the Cayuga area, official plan issues with respect to past gypsum mining activities for Oxford County, zinc exploration in Perth County and land use designations for aggregate extraction in Halton Region and the Halton Hills.

Public Education

The Southwest Ontario District is home to approximately 8 million Ontario residents. To service the many general interest inquiries, staff of the Southwest Ontario District participates in a limited number of public education projects.

The District Geologist is an active member of the PDAC Education Committee. This group's major project is the PDAC Mining Matters, which involves the creation and construction of teaching kits designed for the grade 4 and 7

levels that illustrate the importance of minerals, rocks, metals and mining in today's society. In 2002, the Mining Matters project was highlighted in "Effective Industry Outreach. Two Leading Examples from the Mineral Industry", p.69-75 in *Geoscience Canada*, Volume 29, Number 2.

In 2002, PDAC Mining Matters teacher staff, volunteers and students assembled 700 grade 7 "Mining Matters II – The Earth's Crust" and 300 grade 4 "Deeper and Deeper" units. Southwest Ontario District staff coordinated the collection of rock and mineral samples for the kits. Each grade 7 kit includes 3 samples for each of a variety of 26 rock and mineral types. A cooperative sharing of 2 summer students between PDAC Mining Matters and the Southwest Ontario District Office assisted the sample collection. The rock and mineral samples collected included rhyolite, marble, gneiss, granites, shale, gypsum, quartzite, dolostone, and limestone. Staff also coordinated the donation of quartzite and talc samples from Timmins Resident Geologist Office, conglomerate and barite from the Kirkland Lake Resident Geologist Office, basalt from the Sault Ste. Marie District Geologist Office, and calcite, feldspar, magnetite, mica, and gabbro from the Southern Ontario Resident Geologist Office in Tweed. Samples were donated by Canada Brick, Dufferin Aggregates, Senator Stone Supply Ltd., Carmeuse Lime (Beachville) Ltd., Unimin Canada Inc., Beaver Valley Stone Limited, Fowler Construction, Luzenac Ltd., and CGC Inc.

The District Geologist is involved in a partnership project titled "Geoscape Toronto" that highlights the interaction of geology, landscape, earth and water resources, and people within the Greater Toronto Area (GTA). The Geoscape Toronto poster will be suitable for students, teachers, land-use planners, naturalists and the public. Geoscape Toronto is one of a number of Geoscape projects across Canada, including 2 others in Ontario: Geoscape Ottawa and Geoscape Grand River. The Toronto project includes representatives from the OGS, Geological Survey of Canada (GSC), University of Toronto, Royal Ontario Museum, Ministry of Municipal Affairs and Housing, Toronto Region Conservation Authority, PDAC Mining Matters and the private sector. Project work in 2002 included layout, editing, funding, printing and sales logistics. The Geoscape Toronto poster will be published by the GSC and OGS in early 2003.

Southwest Ontario District staff were involved in other public education projects, including the construction of an Ontario rock and mineral display for the Minister of Northern Development and Mine's office entrance, providing information and materials to local rock, mineral and gem clubs and supplying teaching materials to the Chairman of the Ontario Mining Association.

RECOMMENDATIONS FOR EXPLORATION

In addition to the 3 recommendations for exploration presented below, the recommendations for Eramosa dimension and landscape stone, and Gull River Limestone dimension and landscape stone, outlined in *Report of Activities 2001* (Steele and Barua 2002), and Access to Great Lakes Markets, Multiple Commodities and Sylvania Formation silica sand, outlined in *Report of Activities 2000* (Steele 2001), continue to be valid. The selection of mineral deposits not being mined in the Southwest Ontario District presented in Table 6 are also exploration and development targets.

High-Quality Crushed Stone Aggregate for the Greater Toronto Area (GTA) Market

Market/Use:
Aggregate is a non-renewable resource that is vital for infrastructure construction and maintenance. The GTA presently consumes 50 to 60 million tonnes of aggregate annually. With projected growth over the next 25 years the area will require 1.5 billion tonnes of aggregate. Currently 75% of GTA aggregate production comes from areas governed by the Oak Ridges Moraine Conservation Plan and the Niagara Escarpment Plan, which place significant constraints on the expansion of existing operations or development of new extraction sites (current and future projected production information from Aggregate Producers Association of Ontario, 2002).

Limestone and dolostone from the Amabel, Bobcaygeon and Gull River formations are currently the main crushed stone sources to supply the GTA. However, the current economics of aggregate will change and therefore innovative supply systems may be practical. Significant opportunities will be available for suppliers of high-quality crushed stone.

High-Purity Limestone and Dolostone

Market/Use:
Carbonate rocks are widespread across southwest Ontario and provide raw material for many industries and uses, including lime, chemical and metallurgical stone, environmental applications, fillers, cement and construction aggregates. Exploitation and development of these rocks are dependent upon chemical composition, market demand and proximity to markets.

Projections suggest that there is a growing future market for high-purity limestone and dolostone, particularly for environmental, chemical and filler uses. One target source for high-purity limestone is the Formosa Reef complex of the Amherstburg Formation. The bioherms consist of hard, very fossiliferous and very pure limestone (99% calcite or 55.5% CaO). A target source for the production of high-purity dolomite and calcined products, and already supplying products to the steel industry, is the Guelph Formation. The bank reef complex and inter-reef depositional environments within the Guelph Formation form good targets for very high-purity dolomite deposits. Analyses of Guelph Formation drill core indicate intervals of extremely pure, nearly 100% dolomite (21.8% MgO).

Area:
The Formosa Reef complex of the Amherstburg Formation outcrops in Greenock and Culross townships. Areas of Guelph Formation with potential for quarry development include the northern Bruce Peninsula, the Beachville–Ingersoll region, and lands between Owen Sound and Woodstock.

Reference:
Feenstra and Wilson (1996)
Kelly (1996)

Queenston Formation Shale

Market/Use:
The brick industry in Ontario currently extracts almost all of its raw resources from the Queenston Formation shale. As of January 2003, 7 quarries supply shale for 8 operating brick plants. The $155 million industry is currently operating at capacity, producing over 700 million brick units per year. The 2 major producers, Hanson Canada Brick and Brampton Brick, have recently invested over $85 million in new manufacturing infrastructure.

The Late Ordovician Queenston Formation is a thick sequence of red shale prominently exposed along the base of the Niagara Escarpment. It is a maroon, slightly calcareous to noncalcareous, locally gypsum-bearing shale with interbeds of grey-green shale, limestone and calcareous siltstone. The grey-green beds have a higher lime content. The shale breaks down readily by weathering, leaving a softer residual material that is somewhat leached of lime and exhibits improved ceramic properties.

Area:
The Queenston Formation occupies a narrow, wedge-shaped area located immediately east of the Niagara Escarpment and extending from Owen Sound to the Mississauga and Hamilton areas. It also forms the bedrock of an area bounded by Lake Ontario and the Niagara Escarpment between Hamilton and Niagara Falls. In eastern Ontario, it is found to outcrop in a small area southeast of Ottawa.

To contrast the positive market news, a significant issue for the brick industry is the rapidly shrinking resource area of Queenston shale. The main area of accessible and exploitable Queenston Formation is a narrow, wedge-shaped area located immediately east of the Niagara Escarpment, extending from north Brampton to the Oakville and Hamilton areas. This area has the necessary combination of shale beneath thin overburden that exhibits suitable chemical and physical properties for brick manufacturing. Much of this area has become or is quickly becoming urbanized. The rapid expansions of Oakville, Burlington, Brampton, Georgetown and Milton make the remaining accessible Queenston shale resource highly desirable and valuable.

Due to the rapidly shrinking availability of Queenston Formation shale due to urbanization, in 2000 the OGS initiated a 2-year study to better understand and document the geological properties of the Queenston Formation where it is presently quarried and to investigate its resource potential on a regional scale. In 2001, the study was expanded to include comparative analysis of 2 other Upper Ordovician shale units, the Blue Mountain and Georgian Bay formations. The study's final report was released in January 2003 (Armstrong and Sergerie 2002c). It recommends thin drift areas in Niagara Peninsula, Halton and Peel regions and near the towns of Rosemont, Mansfield, Duntroon and Meaford for further site-specific resource evaluation or development. In addition to 2 published reports, the study resulted in abundant data collection on the lithologic, geochemical, and firing and properties testing parameters of source materials that were released via 4 data disks.

References:

Armstrong (2001a)
Armstrong (2001b)
Armstrong and Frederic (2001)
Armstrong and Sergerie (2002a)
Armstrong and Sergerie (2002b)
Armstrong and Sergerie (2002c)

OGS ACTIVITIES AND RESEARCH BY OTHERS

Table 4 lists new OGS and Geological Survey of Canada (GSC) publications on southwest Ontario released or received in 2002.

The OGS Sedimentary Geoscience Section conducted 5 projects within the Southwest Ontario District in 2002. A summary of each project was published in OGS Summary of Field Work and Other Activities 2002; references to these summaries are included in Table 4.

Derek Armstrong of the OGS Sedimentary Geoscience Section continued into the final year of a mapping, geochemical sampling and resource evaluation project of Upper Ordovician shales of the Blue Mountain, Georgian Bay and Queenston formations. Queenston shale is the primary resource for Ontario's brick industry. Two releases of information and data from the project were published in 2002 (Armstrong and Sergerie 2002a, 2002b). The project's final report was released early in 2003 (Armstrong and Sergerie 2002c). These data, evaluation and recommendations are in high demand from both land use planners and the brick industry.

OGS Sedimentary Geoscience Section staff contributed to 2 aggregate resources inventory projects. Stephen Douglas undertook an aggregate resources inventory compilation of the Oak Ridges Moraine (ORM). The ORM is a large, stratified moraine complex located in southern Ontario that stretches 160 km from the Niagara Escarpment in the west to Northumberland County in the east. Approximately 65% of the ORM area lies within the Greater Toronto Area (GTA). Due to the close proximity of the ORM to the market and the wealth of sand and gravel resources, the moraine is one of the main aggregate sources for the GTA. The final product of this study will be a digital compilation of the aggregate resources for the ORM. This compilation is designed to aid the planning process along the ORM. In a second project, the County of Grey and the OGS have formed a partnership to produce a single Aggregate Resources Inventory Paper (ARIP) covering the County of Grey.

In 2001, the OGS Sedimentary Geoscience Section staff initiated a project to build a digital, detailed, seamless surficial geology map of southern Ontario for the Land Information Ontario (LIO) electronic data warehouse. The database is a response to rapidly increasing need to understand the inherent properties of the unconsolidated deposits that overlie the bedrock of southern Ontario for better urban development, agriculture, construction aggregate, industrial minerals, landfill, hazard lands, groundwater and surface water planning. The project involves the incorporation of approximately 120 Quaternary geology maps. In 2002, field work was conducted to resolve the problems of boundary faults and unlabelled geological entities between and among the existing maps. Concurrent with this, map editing to standardize landform data continued in the office. The finished seamless surficial map is expected to be available in 2003.

Andy Bajc of the OGS Sedimentary Geoscience Section started a project of three-dimensional mapping of the subsurface of the Waterloo region. A detailed understanding of the properties and three-dimensional architecture of Quaternary deposits is important to assist in land use planning and decision making processes. The Regional Municipality of Waterloo (RMOW) is the largest municipal user of groundwater in Canada. The main objective of the project is to generate a three-dimensional geologic model of the Quaternary geology of the RMOW to assist with hydrogeologic modelling.

The Geological Survey of Canada continues to be active in southwest Ontario projects. Since 1993, GSC staff have been leading a geology and hydrogeology study of the Oak Ridges Moraine. The GSC released 2 Open File reports from this project in 2002; these are listed in Table 4.

Additional selected publications received in 2002 by Southwest Ontario District Geology Office (Mines and Minerals Information Centre) that are of reference to southwest Ontario are listed in Table 5.

ACKNOWLEDGEMENTS

The author would like to thank all mineral producers across southwest Ontario who provided access to their operations or supplied information throughout 2002.

The following companies are thanked for their donation of rock or mineral samples for teaching kits: Canada Brick, Dufferin Aggregates, Senator Stone Supply Ltd., Carmeuse Lime (Beachville) Ltd., Unimin Canada Inc., Beaver Valley Stone Limited, Fowler Construction, Luzenac Ltd. and CGC Inc.

The company and staff of Cameco Corporation, Uranium Refining and Conversion Facility, Port Hope and ESSROC Canada Inc. (Italcementi Group), Picton Quarry are thanked for their super effort in hosting the CIM field trip.

REFERENCES

Armstrong, D.K. 2001a. A regional evaluation of the shale resources potential of the Upper Ordovician Queenston Formation, southern Ontario; Ontario Geological Survey, Open File Report 6058, 148p.

Armstrong, D.K. 2001b. Geochemistry of Queenston Formation samples from outcrops, quarries and drill cores, southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 77.

Armstrong, D.K. and Frederic, J.C. 2001. Results of firing and properties testing, Queenston Formation shale, southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 92.

Armstrong, D.K. and Sergerie, P. 2002a. Geochemistry of selected Ordovician and Silurian shale samples from outcrops, quarries and drill cores, southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 107.

Armstrong, D.K. and Sergerie, P. 2002b. Results of 2000–2001 shale drilling program: lithologic core logs, major, minor and trace element analyses; Ontario Geological Survey, Miscellaneous Release—Data 112.

Armstrong, D.K. and Sergerie, P. 2002c. Data for comparative resource evaluation of selected shale units, southern Ontario; Ontario Geological Survey, Open File Report 6094, 160p.

Feenstra, B.H. and Wilson, A.C. 1996. Southwestern Resident Geologist's District; *in* Report of Activities 1995, Resident Geologists; Ontario Geological Survey, Open File Report 5943, p.377-385.

Kelly, R.I., 1996. High-purity calcite and dolomite resources in Ontario; Ontario Geological Survey, Open File Report 5954, 39p.

Natural Resources Canada 2001. Mining and Mineral Processing Operations in Canada 2000–2001, Minerals and Metals Sector; Natural Resources Canada, MR 251, 95p.

Steele, K.G. 2001. Southern Ontario Regional Resident Geologist (Southwest Ontario District)—2000; *in* Report of Activities, 2000, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report, Ontario Geological Survey, Open File Report 6052.

Steele, K.G. and Barua, M. 2002. Southern Ontario Regional Resident Geologist (Southwest Ontario District)—2001; *in* Report of Activities, 2001, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report, Ontario Geological Survey, Open File Report 6084.

Figure 1. Producing Mines and Quarries—Southwest Ontario District, 2002

Producing Mines – Salt and Gypsum

1.	Sifto Canada Inc., Goderich Mine, Goderich	rock salt
2.	The Canadian Salt Company Ltd., Ojibway Mine, Windsor	rock salt
3.	Georgia Pacific Canada Inc., Caledonia No. 3 Mine, Caledonia	gypsum
4.	CGC Inc., Hagersville Mine, Hagersville	gypsum

Producing Quarries – Cement

5.	Lafarge Canada Inc., Woodstock Quarry, Zorra Tp.	limestone
6.	St. Marys Cement Inc., St. Marys Quarry, Blanshard Tp.	limestone
7.	St. Marys Cement Inc., Bowmanville Quarry, Darlington Tp.	limestone
8.	St. Lawrence Cement Inc. Mississauga Quarry, Mississauga	shale

Producing Quarries – Brick Products

9.	Brampton Brick Ltd., Cheltenham Quarry, Chinguacousy Tp.	shale
10.	Century Brick, Georgetown Quarry, Esquesing Tp.	shale
11.	Hanson Canada Brick, Milton Quarry, Esquesing Tp.	shale
12.	Hanson Canada Brick, Burlington Quarry, Burlington	shale
13.	Hanson Canada Brick, Aldershot Quarry, Burlington	shale
14.	George Coultis and Son Ltd., Thedford Quarry, Bosanquet Tp.	shale

Producing Quarries – Chemical, Metallurgical, and Filler Stone Products

15.	E.C. King Contracting Ltd., Sydenham Quarry, Sydenham Tp.	dolostone
16.	Lafarge Canada Inc., Dundas Quarry, West Flamborough Tp.	dolostone
17.	Carmeuse Lime (Beachville) Ltd., Centre Quarry, Zorra Tp.	limestone

Producing Quarries – Dimension, Building, Landscape Stone and Specialty Aggregate Products

18.	A & A Natural Stone Ltd., A & A Quarry, Keppel Tp.	dolostone
19.	Amsen Quarries Ltd., Mar Quarry, Albemarle Tp.	dolostone
20.	Amsen Quarries Ltd., Wiarton Quarry, Amabel Tp.	dolostone
21.	Arriscraft International Inc., Adair Marble Quarries, Albemarle Tp.	dolostone
22.	Bruce Peninsula Stone Ltd., Lindsay Quarry, Lindsay Tp.	dolostone
23.	Bruce Peninsula Stone Ltd., Wiarton Quarry, Amabel Tp.	dolostone
24.	Cut Above Natural Stone, Cut Above Natural Stone Quarry, Rama Tp.	limestone
25.	Deforest Brothers Quarry Ltd., Deforest Brothers Quarry, Caledon Tp.	sandstone
26.	Ebel Quarries Inc., Ebel Quarry, Amabel Tp.	dolostone
27.	Ebel Quarries Inc., Arnold Property Quarry, Amabel Tp.	dolostone
28.	Eisen Quarries Inc. Wiarton Quarry, Amabel Tp.	dolostone
29.	Flamboro Quarries Ltd., Flamboro Quarry, West Flamborough Tp.	dolostone
30.	Georgian Bay Marble and Stone, Wiarton Quarry, Amabel Tp.	dolostone
31.	Georgian Bay Marble and Stone, Cook Quarry, Amabel Tp.	dolostone
32.	Hilltop Stone and Supply Inc., Hilltop Quarry, Esquesing Tp.	sandstone
33.	Owen Sound Ledgerock Ltd., Senesun Quarry, Amabel Tp.	dolostone

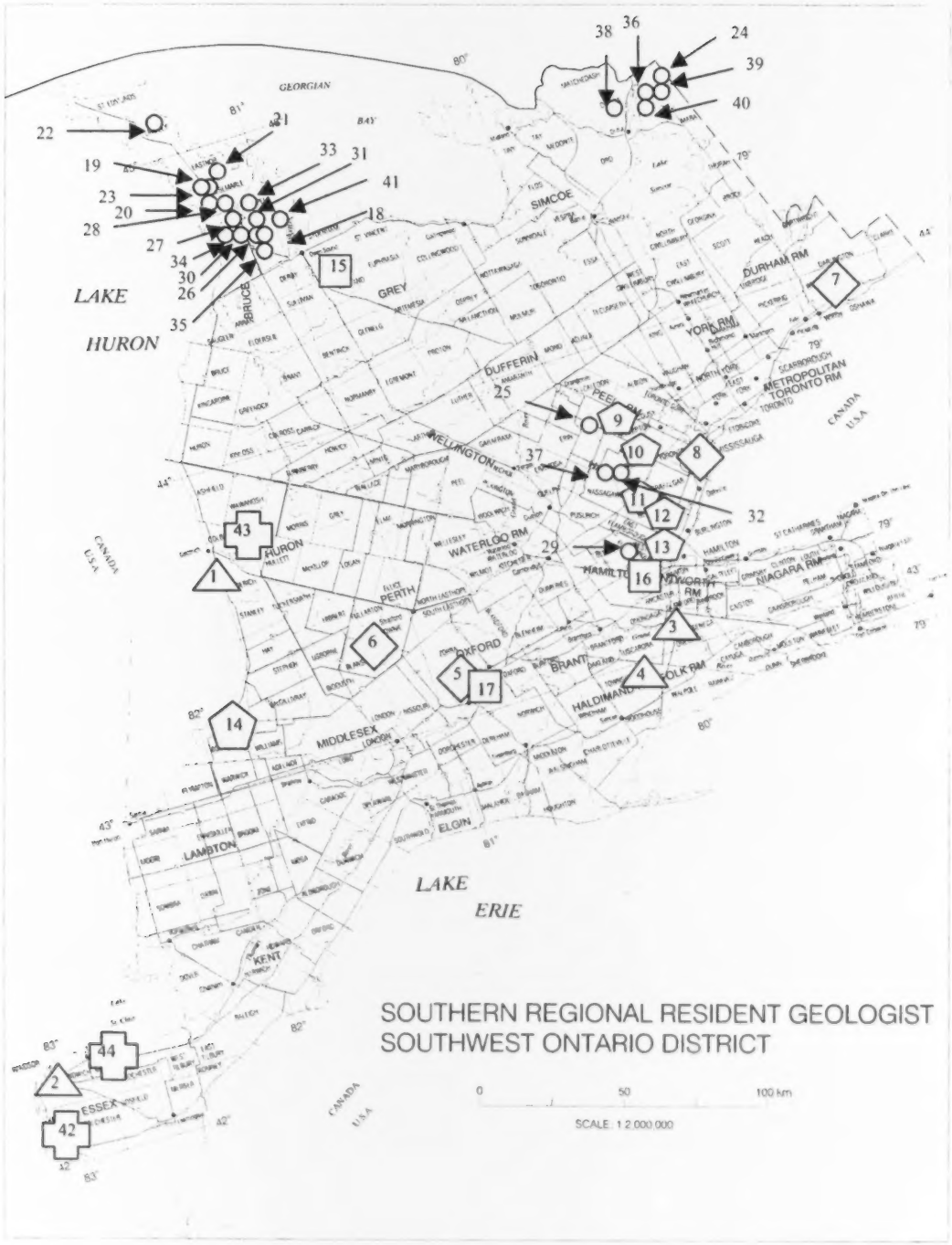
Producing Quarries – Dimension, Building, Landscape Stone and Specialty Aggregate Products
(continued)

34. Owen Sound Ledgerock Ltd., Wiarton Quarry, Amabel Tp.	dolostone
35. Owen Sound Ledgerock Ltd., Owen Sound Quarry, Keppel Tp.	dolostone
36. Rama Stone Quarries Ltd., Fleming Quarry, Rama Tp.	gneiss
37. Rice and McHarg Ltd., Rice and McHarg Quarry, Esquesing Tp.	sandstone
38. Rockleith Quarry Ltd., Rockleith Quarry, Orillia Tp.	limestone
39. Speiran Quarries Ltd., Speiran Quarry, Rama Tp.	limestone
40. Stone Cottage Inn Ltd., Attia Quarry, Rama Tp.	dolostone
41. Wiarton Stone Quarry Inc., Wiarton Stone Quarry, Amabel Tp.	dolostone

Producing Brine Well Fields – Salt

42. General Chemical Canada Ltd., Anderdon Brine Field, Anderdon Tp.	salt in brine
43. Sifto Canada Inc., Goderich Brine Field, Goderich	salt in brine
44. The Canadian Salt Company Ltd., Windsor Brine Field, Windsor	salt in brine

SOUTHWEST ONTARIO DISTRICT—2002



SOUTHWEST ONTARIO DISTRICT—2002

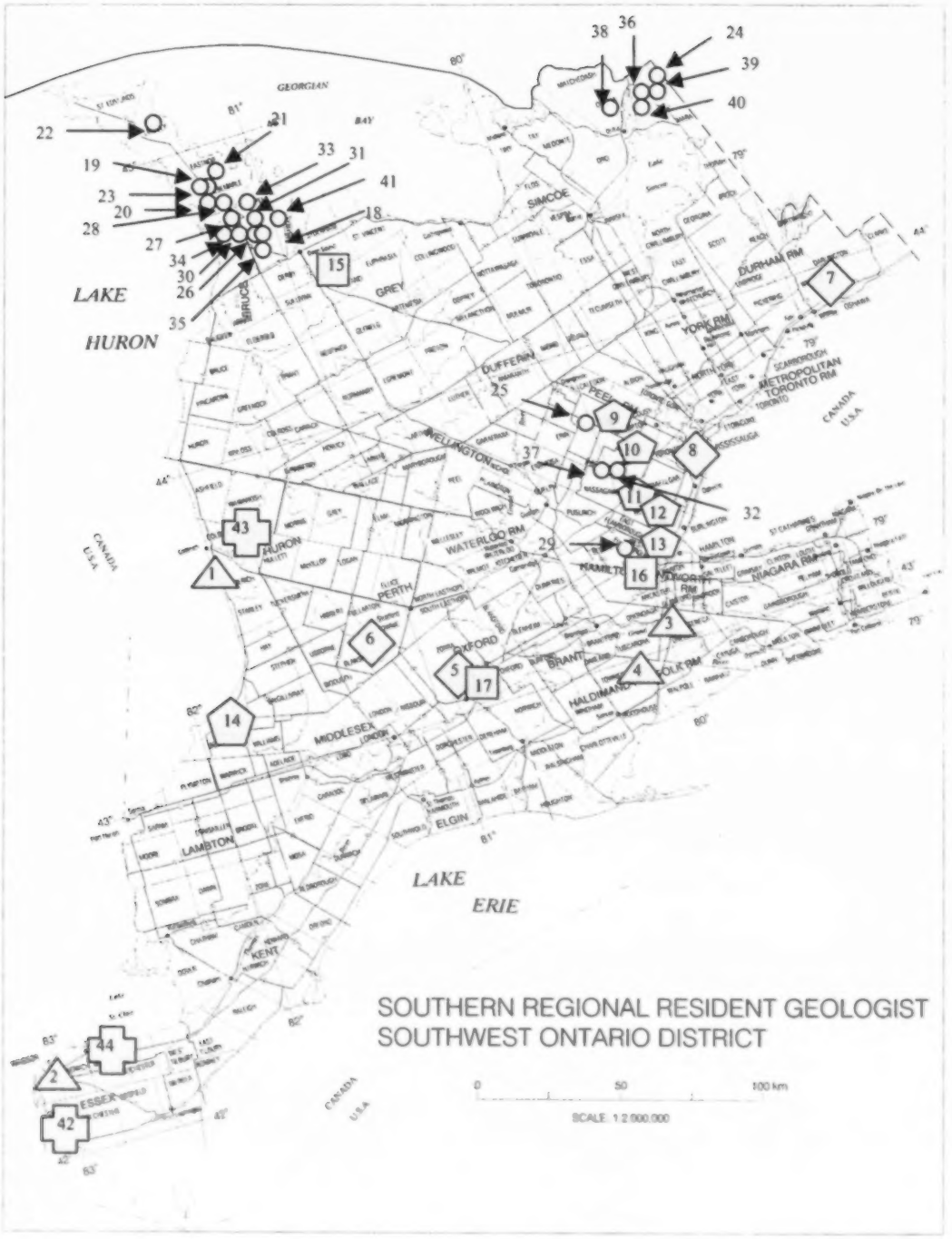


Table 1. Selected industrial mineral and fuel production in Ontario.

	1999	1999	2000	2000	2001p	2001p
	Quantity	Value	Quantity	Value	Quantity	Value
	Thousands tonnes	Thousands $	Thousands tonnes	Thousands $	Thousands tonnes	Thousands $
Non-metals						
Gypsum (1)	1 036	14 677	913	18 087	913	15 840
Salt (1)	7 745	230 153	7 237	212 215	8 473	288 967
Total, Non-metals		**384 102**		**401 055**		**455 885**
Structural Materials						
Clay products (2)	y	128 028	y	134 033	y	155 061
Cement (5)	5 549	511 200	5 344	507 182	5 696	546 349
Lime (3)	1 380	121 950	1 293	115 280	1 067	96 849
Sand and Gravel (4)	105 714	408 321	99 848	395 832	96 466	390 272
Stone * (4)	52 170	385 675	56 272	434 935	60 918	474 267
Total, Structural Materials		**1 555 174**		**1 626 482**		**1 660 309**
Total, Industrial Minerals		**1 939 276**		**2 027 537**		**2 116 194**

	Quantity	Value	Quantity	Value	Quantity	Value
	Thousands $1000m^3$	Thousands $	Thousands $1000m^3$	Thousands $	Thousands $1000m^3$	Thousands $
Fuels						
Natural Gas (1)	422	61 100	580	94 157	352	69 428
Petroleum (1)	238	40 714	231	61 908	259	61 057
Total, Fuels		**101 814**		**156 065**		**130 485**

(1) all production from Southwest Ontario District
(2) 95% production from Southwest Ontario District
(3) >90% production from Southwest Ontario District
(4) >75% production from Southwest Ontario District
(5) >50% production from Southwest Ontario District

p preliminary data
y data not available
* production represents quarry shipments of crude or undressed stone, crushed stone and dressed stone, if the latter is prepared by the quarry operators, at values as reported by operators – this category includes crushed rock aggregate, trap rock, specialty aggregate, dimension stone and calcium carbonate

after Ontario Mineral and Exploration Statistics 2001, MNDM 2002.

Table 2. Mine production and reserves in the southwest Ontario District (as reported by companies to the District Geologist).

Mine	2002 Production Tonnage @ Grade	2001 Production Tonnage @ Grade	2000 Production Tonnage @ Grade	1999 Production Tonnage @ Grade	1998 Production Tonnage @ Grade	Reserves at end of 2002 Tonnage @ Grade
Caledonia No. 3 Mine	274 264 t @ 75-80% gypsum	272 240 t @ 75-80% gypsum	287 000 t @ 75-80% gypsum	418 000 t @ 75-80% gypsum	400 000 t @ 70-75% gypsum	38 900 000 t @ 70-75% gypsum
Hagersville Mine	690 000 t @ 85% gypsum	700 000 t @ 85% gypsum	700 000 t @ 85% gypsum	725 000 t @ 85% gypsum	680 000 t @ 85% gypsum	10 900 000 t @ 85% gypsum
Goderich Mine	5 082 000 t @ 97% NaCl	6 002 000 t @ 97% NaCl	4 200 000 t @ 97% NaCl	4 750 000 t @ 97% NaCl	6 000 000 t @ 97% NaCl	350 000 000 t @ 97% NaCl
Ojibway Mine	2 302 000 t @ 97% NaCl	2 600 000 t @ 97% NaCl	2 350 000 t @ 97% NaCl	2 436 000 t @ 97% NaCl	2 500 000 t @ 97% NaCl	84 300 000 t @ 97% NaCl

t = tonne

Table 3. Property visits conducted by the Southwest Ontario District Geologists in 2002.

Property/Occurrence/Plant/Geological Site	Location	Commodity
Dufferin Aggregates – Milton Quarry	Esquesing Tp.	Dolostone/aggregate
Hanson Canada Brick – Milton Quarry	Milton	Shale
Carmeuse Lime (Beachville) Ltd. – Beachville operations	Zorra Tp.	Limestone/lime
Hilltop Stone & Supply Inc. Quarry	Esquesing Tp.	Sandstone/building stone
Unimin Canada – Midland operations	Midland	Silica
Fowler Construction – Rama Quarry	Rama Tp.	Gneiss/trap rock
Owen Sound Ledgerock Ltd. – Owen Sound Plant	Keppel Tp.	Marble/dolostone/dimension stone
Arriscraft International Inc. – Adair Marble Quarry	Albemarle Tp.	Marble/dolostone/building stone
Ciot Marble and Granite Inc.	Maple	Granite, marble, limestone slabs
John Eisen Ltd.	Fergus	Natural stone landscape products
Roxul Inc.	Milton	Mineral wool insulation
Hanson Canada Brick – Aldershot shale quarry and brick plant	Burlington	Shale/brick
Hanson Canada Brick – Burlington Quarry	Burlington	Shale
Beaver Valley Stone Ltd.	Thornhill	Landscape stone products
Rice & McHarg Quarries Ltd. Quarry	Esquesing Tp.	Sandstone/building stone
CGC Inc. – Hagersville Mine	Oneida Tp.	Gypsum
Zn occurrence, Guelph Formation	Keppel Tp.	Zinc
A & A Natural Stone Quarry	Keppel Tp.	Dolostone/building stone
Georgian Bay Marble & Stone Quarry	Amabel Tp.	Dolostone/building stone
Eisen Quarries Incorporated – Wiarton Quarry	Amabel Tp.	Dolostone/building stone
Bruce Peninsula Stone - Wiarton Quarry	Amabel Tp.	Dolostone/building stone
Senator Stone – Elzevir Quarry	Elzevir Tp.	Marble
Cameco Corporation - Uranium Refining and Conversion Facility	Port Hope	Uranium processing
ESSROC Canada Inc. (Italcementi Group) – Picton Quarry	Picton	Limestone/cement
Canadian Wollastonite – St Lawrence wollastonite deposit	Pittsburgh Tp.	Wollastonite
Palu-Corbelli Corporation – granite deposit	Sheffield Tp.	Granite
Graphite Mountain Inc. – graphite deposit	Bedford Tp.	Graphite

Table 4. New Ontario Geological Survey (OGS) and Geological Survey of Canada (GSC) publications on southwest Ontario released in 2002.

Title	Author	Type and Year of Publication
Report of Activities 2001, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Districts, Mines and Minerals Information Centre, and Petroleum Resources Centre	Sangster, P.J., McGuinty, W.J., Papertzian, V.C., Steele, K.G., Lee, C.R., Laidlaw, D.A., Barua, M., Carter, T.R. and Parkes, B.D.	Ontario Geological Survey, Open File Report 6084, 102p., 2002
Regional 3D Structural Model of the Oak Ridges Moraine and Greater Toronto Area, Southern Ontario: Version 1.0	Logan, C., Sharpe, D.R. and Russell, H.A.J.	Geological Survey of Canada, Open File 4329, 1 CD-ROM, 2002
Phreatic Surface: Oak Ridges Moraine Aquifer Goodwood Area, Ontario	Desbarats, A.J., Hinton, M.J., Logan, C.E., and Sharpe, D.R.	Geological Survey of Canada, Open File 4238, Scale 1:50 000, 2002
Mapping the Subsurface of the Waterloo Region, Southwestern Ontario, Canada	Baje, A.	Three Dimensional Mapping for Groundwater Applications; Geological Survey of Canada, Open File 1449, p.8-12, L.H.Thorleifson and R.C Berg, convenors, 2002
The Need for Basin Analysis in Regional Hydrogeological Studies: Oak Ridges Moraine, Southern Ontario	Sharpe, D.R., Hinton, M.J., Russell, H.A.J. and Desbarats, A.J	Three-Dimensional Mapping for Groundwater Applications, Geological Survey of Canada, Open File 1449, p.62-64, L.H.Thorleifson and R.C Berg, convenors, 2002
Results of 2001–2002 Shale Drilling Program: Lithologic Core Logs, Major, Minor and Trace Element Analyses	Armstrong, D.K. and Sergeric, P.	Ontario Geological Survey, Miscellaneous Release—Data 112, one 3.5 MS-DOS diskette, 2002
Aggregate Resources Inventory Compilation of the Oak Ridges Moraine, Southern Ontario	Douglas, S.	Summary of Field Work and Other Activities 2002, Ontario Geological Survey, Open File Report 6100, p.20-1 to 20-3, 2002
Aggregate Resources Inventory of the County of Grey, Ontario	Baker, C.L.	Summary of Field Work and Other Activities 2002, Ontario Geological Survey, Open File Report 6100, p. 21-1 to 21-3, 2002
A Seamless Quaternary Geology Map of Southern Ontario: Second Phase	Gao, C., Dodge, J.E.P. and MacDonald, I.M.L.	Summary of Field Work and Other Activities 2002, Ontario Geological Survey, Open File Report 6100, p.29-1 to 29-2, 2002
Groundwater Resource Inventory Papers (GRIPs)	Kelly, R.I.	Summary of Field Work and Other Activities 2002, Ontario Geological Survey, Open File Report 6100, p.30-1 to 30-3, 2002
Report of Activities, 2001, Resident Geologist Program, Regional Land Use Geologist Report: Northwestern, Northeastern and Southern Ontario Regions	Debicki, R.L., Drost, A.P., Rowell, D.J. and Yule, G.R.	Ontario Geological Survey, Open File Report 6085, 17p, 2002
Geochemistry of Selected Ordovician and Silurian Shale Samples from Outcrops, Quarries and Drill Cores, Southern Ontario	Armstrong, D.K. and Sergeric, P.	Ontario Geological Survey, Miscellaneous Release—Data 107, One 3.5 MS-DOS diskette, 2002

Title	Author	Type and Year of Publication
Mapping the Subsurface of the Waterloo Region, Southwestern Ontario	Bajc, A.F.	Summary of Field Work and Other Activities 2002, Ontario Geological Survey, Open File Report 6100, p.31-1 to 31-6, 2002
Evaluation of Selected Southern Ontario Shales	Armstrong, D.K.	Summary of Field Work and Other Activities 2002, Ontario Geological Survey, Open File Report 6100, p.33-1 to 33-9, 2002

Table 5. Selected publications received in 2002 by Southwest Ontario District Office (Mines and Minerals Information Centre) of particular reference to Southwest Ontario.

Title	Author	Type and Year of Publication
The Need for Basin Analysis in regional Hydrogeological Studies: Oak Ridges Moraine, Southern Ontario	Sharpe, D.R., Hinton, M.J., Russell, H.A.J. and Desbarats, A.J.	Geoscience Canada, v.29, no.1, March 2002, p.3-20, 2002
Wisconsinan Inter-Lobal Stratigraphy in Three Quarries Near Woodstock, Ontario	Krzyszkowski, D. and Karrow, P.F.	Geographie physique et Quaternaire, v. 55, no.1, p.3-22, 2001
The Quaternary Sedimentology and Stratigraphy of Small, Ice-Proximal Subaqueous Grounding-Line Moraines in the Central Niagara Peninsula, Southern Ontario	Menzies, J.	Geographie physique et Quaternaire, v. 55, no.1, p.75-86, 2001
1989 to 2000 Summary, Oil and Natural Gas Exploration, Underground Storage and Solution Mining in Ontario		Ontario Oil, Gas and Salt Resources Library, 2002
Oil and Gas Pools and Pipelines of Southern Ontario		Ministry of Natural Resources & Ontario Oil, Gas and Salt Resources Library, Version June 1, 2001, map scale 1:360 000, 2001
Source Book 2002, Commercial Membership and Aggregate Directory		Aggregate Producers Association of Ontario, 2002
Industrial Mineral Producers of North America 2000.	Orchard, R.V.	Blendon Information Services, Victoria, B.C, 174p., 2002
Ontario Rocks: Three Billion Years of Environmental Change	Eyles, N.	Fitzhenry and Whiteside Limited, Markham, Ontario, 339p., 2002
Hydrogeology of the Oak Ridges Moraine Aquifer System: Implications For Protection And Management from the Duffins Creek Watershed	Greber, R.E. and Howard, K.	Canadian Journal of Earth Sciences, v.39, no.9, September 2002, p.1333-1348, 2002
Analysis and Reinterpretation of Deformation Features in the Rouge River Valley, Scarborough, Ontario	Godin, A., Brown, R.L., Dreimanis, A., Atkinson, G.A. and Armstrong, D.K.	Canadian Journal of Earth Sciences, v.39, no.9, September 2002, p.1373-1391, 2002
Stratigraphy and Depositional Environments of Niagaran Carbonates, Bruce Peninsula, Ontario	Armstrong, D.K., Goodman, W.R. and Coniglio, M.	Field trip guidebook; Ontario Petroleum Institute, London, 56p., 2002

Table 6. Mineral deposits not being mined in the Southwest Ontario District in 2002.

Abbreviations

AF ..... Assessment Files
CMH ..... Canadian Mines Handbook
GR ..... Geological Report
MDC ..... Mineral Deposit Circular
MDIR ..... Mineral Deposit Inventory Record
MLS ..... Mining Lands, Sudbury
MR ..... Mining Recorder
NM ..... The Northern Miner
OFR ..... Open File Report
PC ..... Personal Communication

Deposit Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Amherstburg Quarry silica prospect (40J/03SE)	Silica	20 m thick over 66 ha (20-26 by 10^6 t @ 94% SiO_2)	Amherst Quarries (1969) Ltd.	OFR 5861, p.32 IMR 9, p.29, 31	Inactive
Big Creek 1 (40J/03SE)	Silica	19.5 m thick @ 25 m (10 by 10^6 t of sandstone)	N/A	IMR 9, p.29	Inactive
Big Creek 1 (40J/03SE)	Silica	14.6 m thick @ 34.4 m (10 by 10^6 t of sandstone)	N/A	IMR 9, p.29	Inactive
Dow-Moore 2-20-12 (40J/16NW)	Salt	21 m thick @ 698 m 73 m thick @ 582 m 114 m thick @ 410 m	N/A	PRW Dow-Moore 2-20-XII	Inactive
Eastnor–Lindsay prospect (41H/03SW)	Dolomite	60 by 10^6 t dolomite @ <0.10% impurities (SiO_2+Fe_2O_3+Al_2O_3)	N/A	PRW OGS Lindsay 7-III W	Inactive
Imperial Oil No. 560, Sombra 2-12-H, Gormlay No. 1 (40J/090NW)	Salt	32.2 m thick @ 612.6 m 84.1 m thick @ 490.7 m 46.9 m thick @ 388.6 m	N/A	PRW Sombra 2-12-H	Inactive
Imperial Oil No. 597, Logierait No. 1-Y-R, R.C. Fleck No. 2B (40J/16NW)	Salt	29.6 m thick @ 680 m 87.8 m thick @ 544 m	N/A	PRW Imperial Oil No. 597B	Inactive
Lindsay prospect (41H/03SW)	Dolomite	>35 by 10^6 t dolomite @ <0.10% impurities (SiO_2+Fe_2O_3+Al_2O_3)	N/A	PRW OGS Lindsay 31-VIII W	Inactive
Patton Farm (40J/03SE)	Silica	5.4 m thick @ 10.1 m	N/A	IMR 9, p.29	Inactive

Deposit Name/ NTS	Commodity	Tonnage-Grade Estimates and/or Dimensions	Ownership References	Reserve References	Status
Sunburst GB #7 McGillivray 41-NB (40P/04NE)	Salt	88.7 m thick @ 363.6 m 5.8 m thick @ 339.5 m	N/A	PRW Sunburst GB #7	Inactive
Tobermory prospect (41H/04NE)	Dolomite	60 by 10^6 t dolomite @ <0.10 impurities (SiO_2+Fe_2O_3+Al_2O_3)	N/A	PRW OGS St. Edmunds 47-III W	Inactive
Union Gas-Enniskillen No. 29, D.V.L.A. No. 1 (40J/16SW)	Salt	25.6 m thick @ 610.8 m 78.6 m thick @ 485.5 m	N/A	PRW Union Gas-Enniskillen No. 29	Inactive
Union Gas-Moore No. 12 P&I Williams No. 1 (40J/16SW)	Salt	26.2 m thick @ 577.3 m 70.7 m thick @ 456.6 m	N/A	PRW Union Gas-Moore No. 12- P&I Williams No. 1	Inactive
Union –Moore No. 22 (40J/16SW)	Salt	36 m thick @ 580 m 32 m thick @ 437 m	N/A	PRW Union Moore No. 22	Inactive

Ontario

Ontario Geological Survey
Resident Geologist Program

Mines and Minerals Information Centre—2002

by

W.J. McGuinty and C.R. Lee

2003

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Toronto – Mines and Minerals Information Centre—2002

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MINES AND MINERALS INFORMATION CENTRE, TORONTO—2002

Part 1: MMIC Activities

W.J. McGuinty[1] and C.R. Lee[2]

[1] Industry Liaison Geologist, Ontario Geological Survey

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INTRODUCTION

Located in Toronto, the Mines and Minerals Information Centre (MMIC) is an information, research and sales facility for the Mines and Minerals Division (MMD), Ministry of Northern Development and Mines (MNDM). The Centre serves the mineral exploration, mining, earth science and land use planning communities and the general public. MMIC offers information and research materials as well as advisory services and expertise on Ontario's geology, rocks and minerals, mineral industries, related regulations and policy. MMIC staff also provide specific assistance and referral for clients who require information concerning Ontario's Mining Act and geoscience information administered, developed and maintained by other ministries, such as soils (Ontario Ministry of Agriculture—OMAF), pits, quarries, aggregates, oil and gas (Ministry of Natural Resources—MNR) and water (Ministry of the Environment—MOE).

MMIC STAFF FUNCTIONS

In 2002, the MMIC was staffed by 4 members of the Ontario Geological Survey's (OGS) Resident Geologist Program (RGP). Ken Steele, Southwest Ontario District Geologist, provides specific assistance and expertise regarding the geology, resources and minerals industry in southwestern Ontario with the assistance of Max Barua, the Southwest Ontario District Support Geologist. Charley Lee, Regional Support Geologist for Southern Ontario, provides lead service for MNDM's Earth Resources and Mineral Exploration webSite (ERMES) information system and for MMIC library and sales counter functions. Bill McGuinty, Industry Liaison Geologist, provides assistance to minerals industry clients in accessing geoscience and mineral-related expertise and policy information from the Ministry of Northern Development and Mines. He also researches and develops other information for the exploration and development industry. All MMIC staff participate in front counter and telephone client service functions with the general public.

Each year the Mines and Minerals Information Centre employs 2 students through the provincial government's Ontario Summer Experience Program and has also been successful over the past several years in obtaining an Ontario –Quebec Exchange Program student. This year, summer students Kathryn Lee and Slawomir Szlapcynski shared a position at MMIC and were joined by O-QEP student Christine Thériault from Montreal. These students provided support to public outreach projects and research that MMIC and the Southwestern Ontario District Geologist office undertook and gained a knowledge of the operations of the Ontario Geological Survey and the minerals industry through working with staff and assisting clients.

MMIC CLIENT PROFILE

The Mines and Minerals Information Centre has a wide variety of clients and users. The Greater Toronto Area (GTA) contains one of the largest groupings of geoscientists, minerals industry specialists, mining and mining service companies in the world, and MMIC counts members of these communities as its core clientele. In addition, government professionals, university and college staff and students in geoscience, engineering, architecture and land use planning use MMIC resources for research projects. The facility is also used by firms collecting information for preliminary environmental investigations.

Approximately 75% of Ontario residents (about 8 million people) have the MMIC as their nearest and primary MNDM contact point. Walk-in, phone and mail clients from the general public make a wide range of inquiries to staff about geology, educational resources in earth science, the mining and minerals industry, government activities and mining history.

Approximately 5700 clients contacted the MMIC in 2002. These contacts can be broken down as follows:

- 2200 general inquiries via the telephone;
- 2500 walk-in clients to use general inquiry/sales/research functions; and
- 1000 telephone and walk-in clients with specific Southwest Ontario District queries handled by District staff.

In addition to these direct contacts, MMIC staff responded to several hundred e-mail inquiries. Electronic traffic and inquiries to the MMIC have increased substantially over the year. This has occurred as a result of a program of distribution of small information notes via e-mail to the minerals exploration community by the Industry Liaison Geologist. When an item or activity of geoscientific, regulatory (mining or financial) or professional interest arises that may be of interest to MNDM clients, a brief message is disseminated via e-mail to 500-600 recipients and industry client groups and associations who may also forward the message to their membership. Industry client groups include formal organizations such as the Ontario Prospectors Association and the Prospectors and Developers Association of Canada as well as informal discussion groups and university organizations.

MMIC SERVICES

ERMES / Geoscience Databases

In December of 2001, MNDM launched an Internet-based data storage and retrieval system called the Earth Resources and Land Information webSite (ERMES). This geoscience data application is hosted in the Land Information Ontario (LIO) system of digital information. ERMES has replaced ERLIS, an in-house computer-based system that was developed in the early 1990s as a basic geographic information system for use in data compilation by staff and MNDM clients. ERMES allows Internet-based searches to be conducted of geoscience information generated or collected by the Ministry. The site is available through the MNDM web page at www.ermes.mndm.gov.on.ca.

Due to the large volume of data available on ERMES and its co-location with other data archived in the Lands Information Ontario system, computer access using "high speed" or cable Internet capability is recommended. ERMES is available to the public through 2 computer terminals located at the MMIC.

The system allows map-based search and compilation capabilities as well as text-based searches of several geoscience databases, including

- **Assessment Files Research Image (AFRI) database:** approximately 65 000 hardcopy assessment reports filed by exploration companies and prospectors since the 1940s that have been captured digitally and now comprise the AFRI database.

- **Mineral Deposit Inventory (MDI) database:** an inventory of approximately 19 000 mineral deposits and occurrences in Ontario. Data has been collected since the early 1970s and is regularly updated.
- **Drill Hole (DH) database:** a detailed index of drill hole information in Ontario. It contains descriptive information for approximately 108 000 percussion, overburden, sonic and diamond drill holes from assessment files on record with the Mines and Minerals Division.
- **Lithogeochemical (LGC) database:** a detailed index of lithogeochemistry information in Ontario. It contains information on more than 30 000 rock samples collected and described by Ministry staff geoscientists during field projects. Major and trace element concentrations were determined by the Ministry's Geoscience Laboratory.
- **Ontario Geological Survey Publications database:** Ontario geological text and map publications have been converted to raster images and coupled with a full-text search, retrieval and viewing system. Over 225 000 pages and 8500 Ontario Geological Survey maps have been captured in raster form.
- **Geology of Ontario Maps:** two attributed Geology of Ontario (GoO) maps are available in ERMES. The Bedrock Geology Data Set, which shows the distribution and description of the bedrock geology of Ontario, and the Quaternary Geology Data Set, which depicts a digital interpretation of the surficial geology of Ontario.

Library Services

The MMIC library provides a selection of reference and topical information on earth science and the minerals industry. Directories, science and industry periodicals and journals are available to clients. Table 1 lists current subscriptions to geoscience- and mining-related newsletters. Table 2 lists the journals and periodical publications added to the MMIC library during 2002.

A limited number of texts and other reference materials are acquired annually for the library based on industry trends and advances in geoscience. Table 3 summarizes the reference materials acquired during the year. Computer-based reference databases are available for both the MMIC library and the MNDM Geoscience Library in Sudbury. Clients may request inter-library loans and transfers from Sudbury and other Ministry offices.

The MMIC library also maintains and updates the complete collection of OGS publications, dating from 1891, and most publications of the Geological Survey of Canada (GSC), dating from 1863, that relate to Ontario. Table 4 lists GSC publications acquired during 2002, and Table 5 lists OGS publications received.

The MMIC Library also maintains a file of topical papers and articles acquired by staff members at meetings or excerpted from publications to which the library does not subscribe. Annual and "update" reports from companies active in Ontario exploration and development projects are also collected.

Publication Sales

The MMIC serves as a walk-in sales counter in Toronto for publications produced by the Mines and Mineral Division (MMD), particularly the Ontario Geological Survey (OGS). The MMIC maintains a retail stock of over 10 000 different Ontario geoscience publications, including

- Geological, geophysical, geochemical and aggregate resource maps and reports;
- Minerals industry statistics and annual activity reports;
- Industrial mineral and mineral deposit circulars;
- Geology guidebooks and posters; and
- Open File Reports

New Mines and Minerals Division hardcopy publications are available at the MMIC following their publication release. Limited quantities of certain publications, such as Open File Reports, are available for sale at the Centre while supplies last, after which time such products may be purchased on-demand from the Ministry's Publication Sales Centre located in Sudbury.

Requests for publications made via telephone, mail or e-mail, as well as all requests for digital data sets, are referred to the Publication Sales Centre for on-demand purchase and distribution. The Publication Sales Centre can be reached toll free in North America by dialling 1-888-415-9845 or by e-mail to pubsales@ndm.gov.on.ca.

Rock Suites and Displays

In addition to the Centre's traditional library- and computer-based geoscience information resources, the MMIC also hosts an extensive rock and mineral collection for display purposes and as archived resource material. This collection is used to promote various minerals-related Ontario industries such as the province's growing dimension stone (granite, marble, etc.,) business. Ontario stone products are used in wall and counter construction at the MMIC to promote these materials as architectural alternatives. Clients and staff borrow from these displays and samples as part of their research or for educational purposes. Other samples and displays have a museum exhibit format within the MMIC.

Education Activities

The MMIC summer experience students assisted the Southwest District Geologist and the District Support Geologist in collecting materials for the preparation of "Mining Matters II" and "Deeper and Deeper" teaching kits. Both are educational products designed by curriculum developers and teachers under the auspices of the Prospectors and Developers Association of Canada (PDAC) to assist Ontario public school teachers in delivering the earth sciences curriculum initiated in 2000 by the Ontario Ministry of Education. The products are available in French and English. More information about these kits can be seen at the PDAC website www.pdac.ca/miningmatters.

Many educators in the Ontario school systems, particularly those teaching grades 4 and 7, contact the MMIC for resource materials to assist in the design of their geoscience education components. Kits containing information about Ontario mines and mineral products, geoscience, geology, rocks and minerals are provided on request. Additional Internet and local sources of relevant earth science information, such as Mining Matters, are also provided.

The MMIC also conveys to the local geoscience community requests by teachers for guest speakers to talk about geology and mining. This means of engaging local industry members in public outreach about minerals and geoscience has elicited a positive response from both geologists and teachers in the Greater Toronto Area.

INDUSTRY LIAISON GEOLOGIST OUTREACH AND PROMOTION ACTIVITIES

In support to promoting MNDM activities and initiatives, the Industry Liaison Geologist (ILG) attended and participated in a number of symposia and conferences during the year. In several cases the ILG was part of the organizing committee for the event. Attending and participating in the following events facilitated obtaining client interaction and commentary on the state of exploration and development in Ontario, Canada and abroad.

- Prospectors and Developers Association of Canada Convention (March 2002, Toronto)
- World Mines Ministries Forum (March 2002, Toronto)
- Conference Board of Canada Mining Disclosure Conference (May 2002, Toronto)
- Northeastern Ontario Mines and Minerals Symposium (April 2002, Timmins (speaker))
- Association des Prospecteurs du Québec Annual Conference (September 2002, Rouyn–Noranda)

- Canadian Mines Ministers Conference (September 2002, Winnipeg)
- Ontario Exploration and Geoscience Symposium (December 2002, Toronto)

In addition to these formal events, the Industry Liaison Geologist attended regularly scheduled meetings of several industry-related organizations throughout the year, including the Toronto Geological Discussion Group, the Halton Area Geological Society and the Toronto Branch of the Canadian Institute of Mining, Metallurgy and Petroleum.

Industry Liaison Presentations

The Industry Liaison Geologist made numerous formal and informal presentations throughout the year, mainly in the form of short overviews on the mining sector's activities in Ontario and the province's regulatory and policy approaches designed to encourage and promote mineral exploration.

Two presentations were made during the Prospectors and Developers Association Convention held in March; one to an international delegation of economic attachés working for the Canadian Department of Foreign Affairs and International Trade (DFAIT), and another to an Indonesian delegation led by Mines Minister Purnomo, who was accompanied by officials from DFAIT and the World Bank.

In mid-April, the ILG provided a talk for the Northeastern Ontario Mines and Minerals Symposium, outlining how the Ministry promotes the attractiveness of the province as a mining investment destination.

On August 19th, the ILG hosted a one-day meeting and made a presentation to the Special Mining Advisor to the President of Peru, Dr. Maria Chappuis, and an accompanying official from Canadian government. Dr. Chappuis was researching the role and services delivered within the regional offices of the MMD. In addition to this objective she was also gathering information on the minerals industry as a client and consumer of those services. This information was to assist in development of a new network of regional mining offices to be developed in Peru with the support of the Canadian International Development Agency.

Prospectors and Developers Association Annual Convention

The number of participants attending the 2002 PDAC Convention and Trade Show approached 7000. Delegates had the opportunity to visit over 250 mining companies, government agencies, industry service and professional organizations on the trade show floor and 200 company displays at the Investors Exchange.

In spite of the challenges of unpredictable commodity prices and equity markets, the tone at the 2002 PDAC annual convention indicated that explorers were taking to field in strength, spurred by recent discoveries and a resurgence of investor interest. As host to approximately 200 exploring companies, Ontario was pleased to see that at least 46 of the exhibitors (25% of the Investors Exchange participants) had active Ontario exploration assets. Visitors to the Ontario Pavilion at the convention were provided with a list of exhibiting companies at the Trade Show and Investors Exchange that have active Ontario exploration projects, ranging from gold and platinum group metals to rare metals and diamonds. Many of the exhibitors placed tent cards with the Ontario word mark in their exhibits to highlight their activity in the Province.

The Industry Liaison Geologist also participated as a member of a panel presentation sponsored by the PDAC and Natural Resources Canada on the "super" flow-through share program. Presentations were made by the Canada Customs and Revenue Agency, NRCan and several provinces offering provincial credits to their resident investors. A package of forms and applicable rules were distributed to attendees.

2002 World Mines Ministries Forum

The second World Mines Ministries Forum was held on March 13 to 15, 2002, at the Metro Toronto Convention Centre. The event was very successful, attracting over 325 delegates from mining companies, regulatory agencies, non government organizations and governments from around the world. The Ministry of Northern Development and Mines played a strong role in this event, contributing organizational support for facilities, registration and on-site operations from the Information and Marketing Services Section and the MMIC. The conference plenary included a speech by the Honourable Dan Newman, Minister of Northern Development and Mines. Dr. John Gammon, Assistant Deputy Minister, Mines and Minerals Division, acted as co-chair of the Forum along with Craig Andrews of the World Bank Group. Dr. Andy Fyon, Sr. Manager of the OGS Precambrian Geosciences Section, also made a presentation in the Geosciences Section of the Forum.

Six themes were presented (with session convenors) at the Forum in 2002:

- Mining and People (The World Bank)
- Creating a Positive Investment Climate (Aird & Berlis LLP & McMillan Binch)
- The Role of Geoscience in Attracting Investment (Natural Resources Canada)
- Governance Issues in the Mining Sector/MMSD (International Institute for Environment and Development)
- Sustainable Development: The Road to Johannesburg Summit 2002 (Natural Resources Canada)
- Regulator's Workshop: Dealing with Voluntary Codes of Conduct (United Nations Environment Programme)

Over 50 WMMF presentations, supporting documents and session summaries are available from the WMMF website at www.wmmf.org.

Canadian Mines Ministers Conference (Winnipeg)

The ILG attended this meeting in support to the Minister of Northern Development and Mines regarding federal and provincial flow-through share incentive programs established in late 2000. The ILG delivered a short presentation to the Intergovernmental Working Group (IGWG) regarding regulatory and other barriers that hinder the efficient use of the incentives by mining companies to attract investment. The ILG is also part of an IGWG subcommittee charged with evaluating these incentives.

At the meeting, provincial Mines Ministers and the Honourable Herb Dhaliwal, Canadian Minister of Natural Resources, received an evaluation report prepared by the IGWG subcommittee recommending the extension of the federal tax credit program for flow-through shares established in late 2000 and proposing certain amendments to the tax credit's structure. The main recommendation was the extension of the credit program for 1 to 2 years beyond the current sunset date of December 2003. The provincial ministers agreed to support the report's recommendations and write letters of support to the federal Minister of Finance.

The IGWG report submitted to the Winnipeg Mines Ministers Conference is available on the Internet at www.nrcan.gc.ca/mms/efab/work/en/itce_evaluation_report_en.pdf. Further discussion of the impacts of flow-through exploration tax credits is available in Part 2 of this report.

2002 Ontario Exploration and Geoscience Symposium "Ontario: an Infinite Exploration Target"

The third annual Ontario Prospectors Association (OPA) Exploration and Geoscience Symposium was held at Queen's Park, Toronto, December 2 to 4, 2002. The Industry Liaison Geologist provided assistance with event organization, facility support and publicity. The event was successful in attracting 401 OPA delegates and 62 Canadian Exploration Geophysicists Society (KEGS) delegates.

The 2-day geoscience program reflected the resurgence in gold exploration and the continued support for development of promising base metal, diamond and platinum group metal projects. Gold exploration updates occupied fully a third of the symposium talks, highlighting exploration from Red Lake to Kirkland Lake. One morning session at the symposium was also dedicated to progress reports from projects supported by the Ontario Mineral Exploration Technologies (OMET) Program. OMET is a 4-year project using an $8 million provincial investment to participate with other investors in research and development projects aimed at new mineral exploration techniques and tools. The OMET program is based in Sudbury, and information on the program and its projects is available at www.omet.laurentian.ca.

As with previous OPA Toronto conferences, the Canadian Exploration Geophysicists Society (KEGS) hosted a concurrent, 1-day symposium on December 3rd. KEGS presentations focused on the "Volume, Visualization and Value of Geophysical Data" and included 14 presentations on new technologies and innovative modeling solutions for geophysical data sets and problems.

Approximately 75 geoscience, technical and service sector exhibits presented over the 2 days highlighted Ontario Government geoscience projects and activities, private sector exploration projects and industry services available to minerals explorers in Ontario.

Two pre-symposium short courses were offered on December 2nd. AMEC delivered a 1-day short course on "Geologic Quality Control in Mining and Exploration" designed for geologists and engineers working in exploration and at mine sites. The main presenter was Scott Long, Principal Geochemist, AMEC Mining and Metals. The goal of the course was to create a better understanding of geologic data and what can be done to improve the accuracy and reliability of exploration datasets and, ultimately, decision making for the geologist.

The second short course was a half-day discussion on the Lake Nipigon Geoscience Initiative (LNGI) led by Tom Lane, Coordinator of the LNGI Scientific Program. The course and related discussions provided background on the geological, geochemical, metallogenic and geophysical framework of the Lake Nipigon Region. Topics discussed included the geology of the Nipigon Plate, recent local exploration, current models, geology and structure of the Archean basement and regional geophysical signatures. The participants discussed the Lake Nipigon Geoscience Initiative within the context of what geological problems need to be resolved and what information is missing.

INDUSTRY LIAISON GEOLOGIST INFORMATION ACTIVITIES—REGULATORY

As part of the information gathering activities, the ILG monitors changes to the regulatory environment that may impact on the province's minerals industry, maintains topical information and communicates with industry associations regarding possible impacts and outcomes. The following is a sampling of the changes that were monitored during the year.

NI 54-101 Communication with Beneficial Owners of Securities of a Reporting Issuer

During 2002, the Prospectors and Developers Association of Canada declared victory in a long term battle fought on behalf of its junior company membership. For many years junior companies have been frustrated in their attempts to communicate in an effective manner with shareholders that bought and sold securities through agencies, such as brokerages. They felt limited in knowing who these investors were. There was a sense that in the very volatile junior mining marketplace the investor was not able to make timely decisions founded on information that could be, and was provided to shareholders known to the issuer. In recent years securities have increasingly not been registered in the names of their beneficial owners, but rather in the names of several agencies, depositories, or their nominees holding for dealers, trust companies or banks who hold on behalf of the actual owners.

In June, Canadian securities regulators adopted National Instrument (NI) 54-101. The Rule based its design on the following principles:

a) all security holders of a reporting issuer, whether registered holders or beneficial owners, should have the opportunity to be treated alike as far as is practicable;
b) efficiency should be encouraged; and
c) the obligations of each party in the security holder communication process should be equitable and clearly defined.

The complete National Instrument is available on the Ontario Securities Commission web page at www.osc.gov.on.ca

Continuous Market Access

In 2002, the British Columbia Securities Commission (BCSC), under the aegis of a new provincial government directive to improve BC's business climate, launched a review of securities rules with a view to improving its capital markets. In November and December representatives of the BCSC presented their concept of Continuous Market Access (CMA) to the Toronto mining community at meetings sponsored by the PDAC and the Ontario Prospectors Association. The BCSC also conducted a financial analysis of the regulatory burdens associated with capital raising with which to guide reforms.

The concept of Continuous Market Access is based on the premise that current markets demand continuous and full disclosure of both a company's corporate and business activities for the benefit of investors. It is also based on the fact that an investor already has or will have a legal remedy through civil liability provisions for redress of loss through fraudulent activities. As stated in BCSC documents,

> [CMA] would replace the prospectus-based system for distributing securities with one that would allow issuers to go to market at any time based on their continuous disclosure record. There would be no mandated offering document, except for an issuer's IPO. For issuers in the system, the prospectus exemptions regime, hold periods and resale restrictions would all disappear along with the prospectus requirement. An enhanced continuous disclosure regime would be introduced that would require issuers to maintain "evergreen" disclosure of all material facts.

The concept would allow "anyone" (an issuer?) registered in one Canadian jurisdiction to do business across Canada and would also create changes to the regime of trading disclosure as it relates to insiders, control persons and significant share holders.

Such liberalization of market access would not come without stronger penalties for abuse of investors. Commissions would be given the power "to order that persons who breach securities law must disgorge their profits, or make restitution to those they have harmed. It also considers giving Commissions the power to order that a professional could not appear before them or prepare documents filed with them on the basis of gross incompetence or egregious conduct." CMA also contemplates new Civil Remedies that would expand investors' ability to sue market participants who break the rules. A class action regime for these actions would also be considered for inclusion in the CMA legislation.

Uniform Market Regulation

During 2002, Canadian securities administrators devoted considerable time and discussion to the study of Uniform Market Regulation.

The Canadian Securities Administrators' (CSA) Uniform Securities Legislation (USL) Project Steering Committee released the resulting concept document in January 2003 for public comment. This Concept Proposal is the result of research and analysis of the securities laws in force in British Columbia, Alberta, Manitoba, Ontario and Québec.

This Concept Proposal outlines "harmonization of securities laws across Canada. In some areas, substantive changes to current laws are proposed. For the most part, these proposed changes are either well-advanced CSA initiatives for which the USL Project presents an ideal opportunity to make necessary legislative amendments or the proposed changes would further the project's complementary goal of streamlining and harmonizing the system of securities regulation in Canada."

The most significant proposed policy changes, some of which have been the subject of demands by the junior mining sector, include

- The ability of a securities regulatory authority to delegate decision-making across all regulatory functions to another securities regulatory authority;
- A streamlined system for interjurisdictional registration of firms and individuals;
- A civil liability regime for secondary market participants; and
- A streamlined securities act with details largely contained in rules to allow future changes to securities laws to be made in a timely and harmonized manner through the rule making process.

CIM Valuation Standards Committee

In March, the Industry Liaison Geologist compiled and submitted comments on behalf of MNDM to the CIM Valuation (CIMVal) Committee's request for comments on their "Draft Standards and Guidelines for Valuation of Mineral Properties". In 1999, The Mining Standards Task Force (MSTF) of the Toronto Stock Exchange and the Ontario Securities Commission recommended that the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) form a committee of valuation practitioners to review and advise on approaches to valuation of Mineral Properties. Draft Discussion Papers were issued in early 2000 and in mid 2001, and on both occasions public input was solicited. Responses were received and have been considered in the last Draft Standards and Guidelines for Valuation of Mineral Properties issued in February 2002. A revised final draft Standards and Guidelines was released on October 1, 2002, for final comment by October 25, 2002.

Disclosure Rules for Mining Companies

On June 4th and 5th, the ILG attended a 2-day conference in Toronto offered by the Conference Board of Canada on public disclosure rules for mining companies. This conference, while discussing in broad terms the issue of mining company public disclosure, had National Instrument 43-101 as its principal focus. NI 43-101 was developed and implemented into law by the Canadian Securities Administrators Association and all provincial securities commissions in February 2001. The rule is a direct product of efforts such as the Mining Standards Task Force to correct inadequacies that permitted several mining stock scandals to occur in the mid to late 1990s.

Although not a new regulatory change in 2002, there is still a considerable need for understanding by companies concerning what NI 43-101 means for them in terms of technical reporting and informing shareholders with accuracy about their mining and exploration activities. Stock market surveillance personnel at this meeting indicate a number of companies, and report writers are still not aware of the new rule's implications. They also indicate that several iterations of a report have been required of some companies to arrive at correct and acceptable disclosure.

Attendance at the conference was principally representatives of major mining companies (52%), followed by mining industry consultants (21%), legal and financial services (15%), junior exploration companies (7%) and government/SROs (5%). Because of the relevance of disclosure to the junior sector, it was surprising how few were represented.

POSSIBLE IMPLICATIONS

Please note these are observations by the author and not to be construed as opinions based in law or within the full context of NI 43-101

NI 43-101 is the catalyst that accelerated professional registration of geoscientists around the country and may become the most routinely tested set of criteria to which Canadian geoscientists will be subjected. It may quickly generate a body of legal study and regulatory understanding to further define responsibilities and qualifications of geoscientists. Legal remedies for bad work or negligence have been in place for some time, licensed or not, and NI 43-101 does not change these requirements. It will however, create a filter or pre-test that should be completed with the undertaking of each new technical project. These guidelines may be applied in the future to assess the competence of professional geoscientists working outside traditional mining and securities (stock market) environments in such areas as municipal planning hearings, geological hazard assessments and hydrogeoscience evaluations where public health and welfare are at issue.

Another aspect of professional practice related to disclosure mentioned several times at the meeting is the professional's responsibility to go beyond his or her specific expertise. For example, environmental, social or legal issues that may be outside the parameters of report writers' stated services, but may be germane to the client and should be identified at least in some form of written communiqué.

MEETING SUMMARY

The following summary highlights some of the key comments provided during the conference. Because of the tight focus on disclosure pertaining to National Instrument 43-101, many key comments and observations were shared and re-iterated by several presenters. This summary is selective and meant for information purposes only.

Deborah McCombe (OSC) and Pamela Egger (BCSC)

These presenters provided overviews of NI 43-101 and what is expected when working within its new framework. Deborah McCombe focused on the history of disclosure rule development and the first year of implementation. The OSC permits disclosure of certain information emitted by a company to go directly to Internet disclosure on SEDAR with no approval by the OSC. These include Annual Information Forms and press releases. Other materials, such as scoping studies for a project belonging to a junior mining company and prospectuses, are reviewed first and compliance issues are resolved before publication.

Companies with a governing jurisdiction other than Ontario but with a "specific connection" to Ontario as defined by resident shareholders or Ontario properties, may be required to provide disclosure information to the OSC.

Pamela Egger provided an overview of the Qualified Person (QP) concept and that person's, or those persons', responsibilities as to the management of oral, written or electronically based continuous disclosure. She also described the potential timelines required for the preparation of and eventual approval of technical information. Further elaboration on disclosure under NI 43-101 is available at both OSC (www.osc.gov.on.ca) and BCSC (www.bcsc.bc.ca) websites.

Both presenters, as well as numerous subsequent presenters, put great emphasis on the property visit by the qualified person, stating that there are very few acceptable situations where the company can seek relief from this aspect of the preparation of a technical report. One of these is the seasonal issue of snow cover that may preclude conducting property visits and continues to be a case by case consideration.

Bernie Haystead (CIBC) and John Postle (Roscoe Postle)

These presenters focused on the evolution of ore reserve definitions in Canada and elsewhere and provided comparisons between various codes currently in use around the world and their suitability to the Canadian regulatory environment. Bernie Haystead gave an overview of the basis under which mineral resources can be converted to reserves and the status of Canadian initiatives, including the CIM ore reserve classification system adopted by the Canadian securities regulatory environment. He also identified other industry initiatives such as the CIM Committee on Valuation Standards and new work on production cost reporting as providing improved standards for ore reserve estimation.

John Postle provided information on the international movement to a reconciliation of mineral reserve definitions under the auspices of the Council of Mining and Metallurgical Institutes (CMMI) Mineral Resources/Reserves International Reporting Standards Committee. Committee members include Australia (AusIMM), Canada (CIM), South Africa (SAIMM), the UK (IMM) and the United States (SME). He also elaborated on several codes in common use around the world such as the JORC (Aus.), IMM (UK) and SME (US) and several government codes which are also in use such as the UNFC, USGS and SAMREC (SA). Legal standing of these codes in certain jurisdictions may require a reconciliation of ore reserves defined by a standard in one jurisdiction using a host county's code. This is now the case in Canada for reserves of offshore mineral resources previously calculated in a code other than the CIM definitions.

Each code makes provision for the professional status of the person competent to report these reserves and resources under the definitions within the code. Most of these are similar to NI 43-101 and to professional geoscience acts developed in Canada.

Steve Vaughan (Macmillan Binch)

This presenter undertook to explain the variable nature of "Materiality", as the word applies in a legal context to disclosure of geotechnical information. Mr. Vaughan concluded that materiality adjusts "like a chameleon" to match the context in which the information is placed. For example, a scoping study for a small gold project undertaken by a major company may not be significant to the company in terms of its preliminary nature and in comparison to its asset base. However, to a junior exploration company who options the project, the asset acquired is perhaps very significant and the study becomes "material" for the purposes of its investors and will require disclosure. A key rule suggested by Mr. Vaughan for when deciding what is material to a disclosure, is that if a QP questions whether a fact is material, it probably is and should be disclosed.

Later speakers, such as Robert Horn (INCO), discussed an extension of this relative materiality comment. He indicated that major companies cannot be used as QPs for juniors in this type of case, nor may the estimates made during a major company's internal evaluation necessarily be acceptable for disclosure purposes by partner junior companies. The criteria used by the major may not be appropriate for the scrutiny used for the disclosure made by the junior.

Fran Manns (TSE) and Leon Lyszkiewicz (CDNX)

Both regulators described the expectations of their respective stock exchanges as to disclosure, as well as their experiences with reports submitted under NI 43-101. A frequent observation during the first year of the new disclosure rule is that submissions did not comply with all of the stated information objectives in NI 43-101. In certain instances compliance with the Instrument was only met on the second or third iteration of a report. The most commonly absent and essential component of a technical submission was said to be data verification (i.e., QA/QC, origin, evaluation of methods used, etc.). The most commonly absent component of continuous disclosure is the stated approval by the company's QP of press releases or other public comments (e.g., web page information).

Lynda Bloom (Analytical Solutions Limited)

This presentation provided background on issues of concern for the QP and investors and, by extension, securities regulators regarding disclosure of analytical results and their interpretation. Included in her description of key concepts were the use of accepted and repeatable analytical methods such as fire assaying, the custody and security from tampering of samples, effective storage of pulps and rejects, development of quality control programs (blanks, standards and duplicates) and accreditation of laboratories (ISO standards and annual round robin tests with peers). Ms. Bloom also identified key points to consider while writing geochemical reports.

Al Gourley (Macleod Dixon)

Mr. Gourley's presentation discussed the issue of liability surrounding disclosure as set out in NI 43-101. His personal observation was that redress by a plaintiff for errors by a qualified person are already in play and the QP concept in itself did not create new liability. However, persons may now seek remedies for noncompliance with the rules of NI 43-101 under tested legal process allowing the parameters of NI 43-101 to act as the guide in civil actions and improving the clarity in these proceedings.

He indicated Canadian Securities Administration rule 53-302 for Civil Recovery covered many aspects of improper disclosure or misrepresentation to shareholders and that there is a need for qualified persons to protect themselves by establishing control of the use of information they produce (i.e., via consent mechanisms).

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the insights and efforts of the clients of the Mines and Minerals Information Centre who shared their observations with staff in order to improve services provided at the MMIC and other MNDM offices. Such interactions assist in building the broad-based knowledge resource required by MNDM staff to enhance mineral sector competitiveness and ensure the sustainable development of Ontario's mineral resources. The authors also recognize and deeply appreciate the efforts of Ken Steele and Max Barua for their support and assistance in delivering program services and client support activities at the MMIC during the past year.

Table 1. Newsletters received by the MMIC Library in 2002.

Title
Alaska GeoSurvey News – Newsletter, Alaska Division of Geological and Geophysical Surveys
AusGeo News – Geoscience Australia
Canadian Copper – Canadian Copper & Brass Development Association
GEOLOG – News Magazine of the Geological Association of Canada
ICMM Newsletter – International Council on Mining and Metals
Iowa Geology - Iowa Department of Natural Resources
Lunar and Planetary Information Bulletin - Lunar and Planetary Institute
Mineralogical Association of Canada Newsletter
Nevada Geology – Newsletter of the Nevada Bureau of Mines and Geology
Newsletter – International Liaison Group on Gold Mineralization
Nova Scotia Minerals Update - Nova Scotia Natural Resources
Ohio Geology - Ohio Department of Natural Resources
Outlook - Missouri Department of Natural Resources
PDAC in Brief – Prospectors and Developers Association of Canada
Pennsylvania Geology - Pennsylvania Department of Conservation and Natural Resources
R & D - Research and Development at the Alberta Research Council
Rock Chips - Alberta Geological Survey
Safety Focus - Mines and Aggregates Safety and Health Association
The Geologic Record - Kansas Geological Survey
Washington Geology - Washington State Department of Natural Resources
Wat/What on Earth - University of Waterloo Department of Earth Sciences

Table 2. Journals and periodicals received by the MMIC Library in 2002.

Title
Aggregates & Roadbuilding
Canadian Journal of Earth Sciences
Canadian Mining Journal
Canadian Mining and Metallurgical Bulletin - Canadian Institute of Mining, Metallurgy and Petroleum
Economic Geology – Bulletin of the Society of Economic Geologists
Engineering and Mining Journal
Géographie Physique et Quaternaire
Geoscience Canada
Geotimes – News and Trends in Geoscience - American Geological Institute
Industrial Minerals
Mineralogical Association of Canada – The Canadian Mineralogist
Mining and Exploration Company Financings - Gamah International Limited
Mining Journal
Mining Magazine
North American Minerals News – Industrial Minerals Markets of USA, Canada, Mexico and the Caribbean
Northern Miner
Northern Ontario Business
Provincial Geologists Journal - Committee of Provincial Geologists
The Ontario Prospector

Table 3. Selected new reference publications received by the MMIC Library in 2002.

Title	Author	Type and Year of Publication
Drift Exploration in Glaciated Terrain	McClenaghan, M.B., Bobrowsky, P.T., Hall, G.E.M. and Cook, S.J. (eds.)	The Geological Society, Special Publication No. 185, London, 350p., 2001
Mining and Mineral Processing Operations in Canada 2000-2001	Jérôme, A.	MR 251, Minerals and Metals Sector, Natural Resources Canada, Ottawa, 95p., 2001
Industrial Minerals in Canada	Dunlop, S. and Simandl, G.J. (eds.)	Canadian Institute of Mining, Metallurgy and Petroleum, Special Volume 53, Montreal, 391p., 2001
Metallurgical Works in Canada: Primary Iron and Steel 2001	Jérôme, A.	MR 252, Minerals and Metals Sector, Natural Resources Canada, Ottawa, 39p., 2001
Ontario Mining and Exploration Directory 2002	van Reenen, E. (ed.)	Directory, Naylor Publications Company (Canada), Winnipeg Manitoba, 54p., 2002
Platinum 2002	Kendall, T. (ed.)	Platinum Report, Johnson Matthey Public Ltd. Company, London England, 52p., 2002
Ontario Rocks: Three Billion Years of Environmental Change	Eyles, N.	Fitzhenry & Whiteside Limited, Markham Ontario, 339p., 2002
Breaking New Ground : Mining, Minerals, and Sustainable Development	International Institute for Environment and Development and World Business Council for Sustainable Development	MMSD Project Report, Earthscan Publications Ltd., London UK, 441p., 2002
Tax Credits for Mineral Exploration Flow-Through Shares	The Intergovernmental Working Group on the Mineral Industry	A Preliminary Report, 2002 Mines Ministers' Conference, Winnipeg Manitoba, 51p., 2002
2002/03 CAMESE Compendium of Canadian Mining Suppliers	J.G. Baird, Director	The Canadian Association of Mining Equipment and Services for Export, Markham Ontario, 162p., 2002
Manitoba Annual Report 2001–2002	Manitoba Industry, Trade and Mines	Annual Report, Manitoba Industry, Trade and Mines, Winnipeg Manitoba, 113p., 2002
Stratigraphy and Depositional Environments of Niagaran Carbonates, Bruce Peninsula, Ontario	Armstrong, D.K., Goodman, W.R. and Coniglio, M.	Field Trip Guide Book, Ontario Petroleum Institute, London Ontario, 60p., 2002
Platinum 2002 Interim Review	Kendall, T. (ed.)	Platinum Report, Johnson Matthey Public Limited Company, London England, 28p., 2002
Facts and Figures 2001	The Mining Association of Canada	Facts and Figures, The Mining Association of Canada, Ottawa, 64p., 2002
Faits et Chiffres 2001	L'Association minière du Canada	Faits et Chiffres, L'Association minière du Canada, Ottawa, 64p., 2002
Mining: A Survey of Global Reporting Trends	KPMG International	A Survey of Global Reporting Trends, KPMG International, 83p., 2000
Canadian Mines Handbook 2002–03	Giancola, D. (ed.)	Business Information Group, Toronto, 624p., 2002

Table 4. Geological Survey of Canada publications incorporated into the MMIC Library during 2002.

Title	Author	Type and Year of Publication
A Digital Database of Permafrost Thickness in Canada	Smith, S.L. and Burgess, M.M.	Open File 4173, 38p., 2002. Accompanied by 1 diskette.
Indicator Mineral Content and Geochemistry of Till Around the Peddie Kimberlite, Lake Timiskaming, Ontario	McClenaghan, M.B., Kjarsgaard, B.A. and Kjarsgaard, I.M.	Open File 4262, 140p., 2002
Whole-rock Chemical Analyses from the Birch–Uchi Greenstone Belt, Superior Province, Ontario	Rogers, N.	Open File 4271, 1 diskette, 2002
Polarization Analysis of Four Canadian National Seismograph Network (CNSN) Stations	Bent, A.L.	Open File 4273, 70p., 2002
Focal Mechanisms for Eastern Canadian Earthquakes of 2000	Bent, A.L. and Drysdale, J.	Open File 4289, 110p., 2002
Geology, Confederation Lake, Ontario	Rogers, N.	Open File 4265, scale 1:50 000, 2002
Regional GIS Database for the Abitibi Greenstone Belt, Ontario	Panagapko, D.A., Harris, J.R., Valade, L. and Ayer, J.A.	Open File 4295, 2 CD-ROM's, 2002
Regional 3D Structural Model of the Oak Ridges Moraine and Greater Toronto Area, Southern Ontario: Version 1.0	Logan, C., Sharpe, D.R. and Russell, H.A.J.	Open File 4329, 1 CD-ROM, 2002
Underwater and Shoreline Features of the Rideau Canal: Smiths Falls to Westport	Kettles, I.M., Douma, M., Lauer, K., Fooks, L. and Hunter, J.A.M.	Open File 4008, 1 poster, 2002
Phreatic Surface: Oak Ridges Moraine Aquifer Goodwood Area, Ontario	Desbarats, A.J., Hinton, M.J., Logan, C.E. and Sharpe, D.R.	Open File 4238, 1 sheet, 2002
Peatlands of Canada Database	Tarnocai, C., Kettles, I.M. and Lacelle, B.	Open File 4002, 1 CD-ROM, 2002
Airborne Gamma Ray Spectrometry Compilation Series, Gods Lake–Winisk Lake, Manitoba–Ontario	Carson, J.M., Holman, P.B., Ford, K.L., Grant, J.A. and Shives, R.B.K.	Open File 4293, 8 Colour Maps, Scale 1:1 000 000, 2002
Airborne Gamma Ray Spectrometry Compilation Series, Lake of the Woods, Ontario–Manitoba	Carson, J.M., Holman, P.B., Ford, K.L., Grant, J.A. and Shives, R.B.K.	Open File 4323, 8 Colour Maps, Scale 1:1 000 000, 2002
Mineralogy of Kimberlite Boulders from Eskers in the Lake Timiskaming and Kirkland Lake Areas, Northeastern Ontario	McClenaghan, M.B., Kjarsgaard, I.M., Kjarsgaard, B.A. and Heaman, L.M.	Open File 4361, 1 CD-ROM, 2002
Airborne Gamma Ray Spectrometry Compilation Series, Lake Nipigon, Ontario	Carson, J.M., Holman, P.B., Ford, K.L., Grant, J.A. and Shives, R.B.K.	Open File 4325, 8 Colour Maps, Scale 1:1 000 000, 2002
PaleoGALLERY: Images from the Past about Studying the Past	McCracken, A.D.	Open File 4416, 1 colour poster, 2002
Database for CAMIRO Project 94E07: Interrelationships between Subvolcanic Intrusions, Large-scale Alteration Zones and VMS Deposits	Galley, A., Bailes, A., Hannington, M., Holk, G., Katsube, J., Paquette, F., Paradis, S., Santaguida, F. and Taylor, B.; Hillary, B. (Comp.)	Open File 4431, 1 CD-ROM, 2002
Workshop on Landslide Hazards and Risk Management in Canada	Couture, R.	Open File 4316, 36p., 2002
Airborne Gamma Ray Spectrometry Compilation Series, Sudbury-Lake Superior, Ontario-Quebec	Carson, J.M., Holman, P.B., Ford, K.L., Grant, J.A. and Shives, R.B.K.	Open File 4363, 8 Colour Maps, Scale 1:1 000 000, 2002
Airborne Gamma Ray Spectrometry Compilation Series, Timmins, Ontario	Carson, J.M., Holman, P.B., Ford, K.L., Grant, J.A. and Shives, R.B.K.	Open File 4364, 8 Colour Maps, Scale 1:1 000 000, 2002
Three-Dimensional Geological Mapping for Groundwater Applications	Thorleifson, L.H. and Berg, R.C. (Convenors)	Open File 1449, 87p., 2002
Geology and Tectonostratigraphic Assemblages, Western Wabigoon Subprovince, Ontario	Sanborn-Barrie, M., Skulski, T., Percival, J.A., Whalen, J.B., Tomlinson, K.Y., McNicoll, V. and Stott, G.M.	Open File 4255, 1 Colour Map, Scale 1:250 000, 2002
Geology and Tectonostratigraphic Assemblages, North Central Wabigoon Subprovince, Ontario	Percival, J.A., Whalen, J.B., Brown, J.L. and McNicoll, V.	Open File 4270, 1 Colour Map, Scale 1:250 000, 2002

Title	Author	Type and Year of Publication
Geology and Tectonostratigraphic Assemblages, South-Central Wabigoon Subprovince, Ontario	Stone, D., Tomlinson, K.Y., Davis, D.W., Fralick, P., Hallé, J., Percival, J.A. and Pufahl, P.	Open File 4284, 1 Colour Map, Scale 1:250 000, 2002
Geology and Tectonostratigraphic Assemblages, Eastern Wabigoon Subprovince, Ontario	Stott, G.M., Davis, D.W., Parker, J.R., Straub, K.J. and Tomlinson, K.Y.	Open File 4285, 1 Colour Map, Scale 1:250 000, 2002

Table 5. Ontario Geological Survey publications received by the MMIC Library in 2002.

Title	Author	Type and Year of Publication
Precambrian Geology Compilation Series–White River Sheet	Santaguida, F.	Ontario Geological Survey, Map 2666, scale 1:250 000, 2002
Precambrian Geology Compilation Series–Schreiber Sheet	Santaguida, F.	Ontario Geological Survey, Map 2665–Revised, scale 1:250 000, 2002
Geology of Burrows, Kemp and Mond Townships, Shining Tree Area	Machado, G.	Ontario Geological Survey, Open File Report 6077, 41p., 2002. Accompanied by Preliminary Map P.3445
Precambrian Geology, Burrows, Kemp and Mond Townships	Machado, G. and Longuépée, H.	Ontario Geological Survey, Preliminary Map P.3445, scale 1:20 000, 2002
Wawang Lake–English River Lake Sediment Survey, Northwestern Ontario: PGE Data and Final Results/Interpretation of Lake Sediment Geochemistry	Dyer, R.D.	Ontario Geological Survey, Open File Report 6076†, 70p., 2002
Quaternary Geology, Roche Lake Area	Morris, T.F.	Ontario Geological Survey, Map 2672, scale 1:50 000, 2002
Quaternary Geology, Opasatika Lake Area	Morris, T.F.	Ontario Geological Survey, Map 2673, scale 1:50 000, 2002
Quaternary Geology, Woman Falls Area	Morris, T.F.	Ontario Geological Survey, Map 2674, scale 1:50 000, 2002
Quaternary Geology, Wakusimi River Area	Morris, T.F.	Ontario Geological Survey, Map 2675, scale 1:50 000, 2002
Satellite Image–Opasquia Lake Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3465, scale 1:100 000, 2002
Satellite Image–Makoop Lake Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3466, scale 1:100 000, 2002
Satellite Image–Makoop Lake Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3467, scale 1:100 000, 2002
Satellite Image–Asheweig River Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3468, scale 1:100 000, 2002
Satellite Image–Asheweig River Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3469, scale 1:100 000, 2002
Satellite Image–Winiskisis Channel Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3470, scale 1:100 000, 2002
Satellite Image–Makoop Lake Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3474, scale 1:100 000, 2002
Satellite Image–Makoop Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3475, scale 1:100 000, 2002
Ontario Geological Survey 2001. Airborne magnetic and electromagnetic surveys, residual magnetic field and electromagnetic anomalies, Stormy Lake area	Operation Treasure Hunt	Ontario Geological Survey, Map 82 178 - 82 186, scale 1:50 000, 2001
Ontario Geological Survey 2001. Airborne magnetic and electromagnetic surveys, shaded image of the second vertical derivative of the magnetic field and Keating coefficients, Stormy Lake area	Operation Treasure Hunt	Ontario Geological Survey, Map 82 187 - 82 195, scale 1:50 000, 2001

Title	Author	Type and Year of Publication
Ontario Geological Survey 2001. Airborne magnetic and electromagnetic surveys, EM decay constant and electromagnetic anomalies, Stormy Lake area	Operation Treasure Hunt	Ontario Geological Survey, Map 82 196 - 82 204, scale 1:50 000, 2001
Ontario Geological Survey 2001. Airborne magnetic and electromagnetic surveys, apparent conductance and electromagnetic anomalies, Stormy Lake area	Operation Treasure Hunt	Ontario Geological Survey, Map 82 205 - 82 213, scale 1:50 000, 2001
Ontario Geological Survey 2002. Airborne magnetic and electromagnetic surveys, total magnetic field and electromagnetic anomalies, River Valley West area--Purchased data	Operation Treasure Hunt	Ontario Geological Survey, Map 60 195, scale 1:50 000, 2002
Ontario Geological Survey 2002. Airborne magnetic and electromagnetic surveys, second vertical derivative of the magnetic field and Keating coefficients, River Valley West area--Purchased data	Operation Treasure Hunt	Ontario Geological Survey, Map 60 196, scale 1:50 000, 2002
Ontario Geological Survey 2002. Airborne magnetic and electromagnetic surveys, apparent resistivity and electromagnetic anomalies, River Valley West area--Purchased data	Operation Treasure Hunt	Ontario Geological Survey, Map 60 197, scale 1:50 000, 2002
Ontario Geological Survey 2002. Airborne magnetic and electromagnetic surveys, residual magnetic field and electromagnetic anomalies, Robb-Jamieson area--Purchased data	Operation Treasure Hunt	Ontario Geological Survey, Map 60 198, scale 1:50 000, 2002
Ontario Geological Survey 2002. Airborne magnetic and electromagnetic surveys, second vertical derivative of the magnetic field and Keating coefficients, Robb-Jamieson area--Purchased data	Operation Treasure Hunt	Ontario Geological Survey, Map 60 199, scale 1:50 000, 2002
Ontario Geological Survey 2002. Airborne magnetic and electromagnetic surveys, EM decay constant and electromagnetic anomalies, Robb-Jamieson area--Purchased data	Operation Treasure Hunt	Ontario Geological Survey, Map 60 200, scale 1:50 000, 2002
Ontario Geological Survey 2002. Airborne magnetic and electromagnetic surveys, residual magnetic field and electromagnetic anomalies, Turnbull-Godfrey area--Purchased data	Operation Treasure Hunt	Ontario Geological Survey, Map 60 204, scale 1:50 000, 2002
Ontario Geological Survey 2002. Airborne magnetic and electromagnetic surveys, second vertical derivative of the magnetic field and Keating coefficients, Turnbull-Godfrey area--Purchased data	Operation Treasure Hunt	Ontario Geological Survey, Map 60 205, scale 1:50 000, 2002
Sturgeon Lake—Lake St. Joseph Area Lake Sediment Survey: Operation Treasure Hunt	Russell, D.F. and Jackson, J.E.	Ontario Geological Survey, Open File Report 6087†, 199p., 2002
Precambrian Geology of Street Township, Southern and Grenville Provinces	Easton, R.M. and Murphy, E.I.	Ontario Geological Survey, Open File Report 6078, 149p., 2002. Accompanied by Map P.3427
Geological Compilation of the Swayze Area, Abitibi Greenstone Belt	Ayer, J.A. and Trowell, N.F.	Ontario Geological Survey, Preliminary Map P.3511*, scale 1:100 000, 2002
Precambrian Geology, Entwine Lake Intrusion	Arnold, J.	Ontario Geological Survey, Preliminary Map P.3516, scale 1:20 000, 2002
Kimberlite and Base Metal Exploration Targets, Derived from Overburden Heavy Mineral Data, Schreiber Area, Northwestern Ontario	Morris, T.F., Pitre, S.A. and Larose, T.M.	Ontario Geological Survey, Open File Report 6074†, 113p., 2002
Kimberlite and Base Metal Exploration Targets, Derived from Overburden Heavy Mineral Data, Longlac Area, Northwestern Ontario	Morris, T.F., Slattery, S.R., Pitre, S.A., Larose, T.M. and Semenyna, L.	Ontario Geological Survey, Open File Report 6075†, 125p., 2002
Satellite Image—Island Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3471, scale 1:100 000, 2002
Satellite Image—Asheweig River Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3476, scale 1:100 000, 2002

Title	Author	Type and Year of Publication
Satellite Image— Asheweig River Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3477, scale 1:100 000, 2002
Satellite Image—Winiskisis Channel Area Southhwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3478, scale 1:100 000, 2002
Satellite Image—Deer Lake Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3479, scale 1:100 000, 2002
Satellite Image—North Spirit Lake Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3481, scale 1:100 000, 2002
Precambrian Geology of Kitto Township, Beardmore Area, Northwestern Ontario	Hart, T.R., terMeer, M., Jolette, C. and Duggan, B.M.	Ontario Geological Survey, Preliminary Map P.3512, scale 1:20 000, 2002
Precambrian Geology of Eva and Summers Townships, Beardmore Area, Northwestern Ontario	Hart, T.R., terMeer, M., Jolette, C., Thibeault, S. and Robinson, A.	Ontario Geological Survey, Preliminary Map P.3513, scale 1:20 000, 2002
Precambrian Geology of Dorothea and Sandra Townships, Beardmore Area, Northwestern Ontario	Hart, T.R., terMeer, M., Jolette, C., Thibeault, S. and Robinson, A.	Ontario Geological Survey, Preliminary Map P.3514, scale 1:20 000, 2002
Precambrian Geology of the Paint Lake Fault Area, Northwestern Beardmore–Geraldton Belt	DeWolfe, J.C.	Ontario Geological Survey, Preliminary Map P.3515, scale 1:10 000, 2002
Report of Activities 2001, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts	Lichtblau, A., Raoul, A., Ravnaas, C., Storey, C.C., Kosloski, L., and Raoul, A.	Ontario Geological Survey, Open File Report 6079, 125p., 2002
Report of Activities 2001, Resident Geologist Program, Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District	Mason, J.K., White, G.D., Scott, J.F., O'Brien, and M.S., Komar, C.	Ontario Geological Survey, Open File Report 6080, 39p., 2002
Report of Activities 2001, Resident Geologist Program, Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District	Schnieders, B.R., Scott, J.F., Smyk, M.C., Parker, D.P. and O'Brien, M.S.	Ontario Geological Survey, Open File Report 6081, 45p., 2002
Report of Activities 2001, Resident Geologist Program, Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts	Atkinson, B.T., Hailstone, M., Seim, G.Wm., Draper, D.M., Farrow, D. and Hope, P.	Ontario Geological Survey, Open File Report 6082, 79p., 2002
Report of Activities 2001, Resident Geologist Program, Kirkland Lake Regional Resident Geologist Report: Kirkland Lake and Sudbury Districts	Meyer, G., Cosec, M., Grabowski, G.P.B., Guindon, D.L., Chaloux, E.C. and Stewart, J.M.	Ontario Geological Survey, Open File Report 6083, 94p., 2002
Report of Activities 2001, Resident Geologist Program, Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Districts, Mines and Minerals Information Centre, and Petroleum Resources Centre	Sangster, P.J., McGuinty, W.J., Papertzian, V.C., Steele, K.G., Lee, C.R., Laidlaw, D.A., Barua, M., Carter, T.R. and Parkes, B.D.	Ontario Geological Survey, Open File Report 6084, 102p., 2002
Report of Activities 2001, Resident Geologist Program, Regional Land Use Geologist Report: Northwestern, Northeastern and Southern Ontario Regions	Debicki, R., Drost, A., Rowell, D. and Yule, G.	Ontario Geological Survey, Open File Report 6085, 17p., 2002
Regional Modern Alluvium Sampling Survey of the Mattawa–Cobalt Corridor, Northeastern Ontario	Reid, J.L.	Ontario Geological Survey, Open File Report 6088†, 235p., 2002
Lac des Iles–Black Sturgeon River Area Lake Sediment Survey: Operation Treasure Hunt	Dyer, R.D. and Russell, D.F.	Ontario Geological Survey, Open File Report 6096†, 134p., 2002
Geology of Mafic Intrusions of Flett and Angus Townships, Grenville Province	Easton, R.M.	Ontario Geological Survey, Open File Report 6090, 70p., 2002. Accompanied by Map P.3452
Precambrian Geology of Denton and Carscallen Townships, Timmins West Area	Hall, L.A.F. and Smith, M.D.	Ontario Geological Survey, Open File Report 6093, 75p., 2002. Accompanied by Map P.3517
Precambrian Geology, Denton and Carscallen Townships	Hall, L.A.F. and Smith, M.D.	Ontario Geological Survey, Preliminary Map P.3517, scale 1:20 000, 2002
Precambrian Geology, Yelling Lake Area	Stone, D. and Hallé, J.	Ontario Geological Survey, Preliminary Map P.3518, scale 1:50 000, 2002
Industrial Mineral Assessment and Sampling of Mica in Central and Eastern Ontario	Watts, Griffis and McOuat and Ontario Geological Survey	Ontario Geological Survey, Open File Report 6086, 124p., 2002. Accompanied by 1 CD-ROM

Title	Author	Type and Year of Publication
Satellite Image—North Caribou Lake Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3483, scale 1:100 000, 2002
Satellite Image—Wunnummin Lake Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3484, scale 1:100 000, 2002
Satellite Image—Wunnummin Lake Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3485, scale 1:100 000, 2002
Satellite Image—Lansdowne House Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3486, scale 1:100 000, 2002
Satellite Image—Deer Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3487, scale 1:100 000, 2002
Satellite Image—North Spirit Lake Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3488, scale 1:100 000, 2002
Satellite Image—North Spirit Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3489, scale 1:100 000, 2002
Satellite Image—North Caribou Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3491, scale 1:100 000, 2002
Satellite Image—Wunnummin Lake Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3492, scale 1:100 000, 2002
Satellite Image—Wunnummin Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3493, scale 1:100 000, 2002
Satellite Image—Lansdowne House Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3494, scale 1:100 000, 2002
Satellite Image—Carroll Lake Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3495, scale 1:100 000, 2002
Satellite Image—Trout Lake Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3496, scale 1:100 000, 2002
Satellite Image—Trout Lake Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3497, scale 1:100 000, 2002
Satellite Image—Lake St. Joseph Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3498, scale 1:100 000, 2002
Satellite Image—Lake St. Joseph Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3499, scale 1:100 000, 2002
Satellite Image—Miminiska Lake Area Northeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3501, scale 1:100 000, 2002
Satellite Image—Fort Hope Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3502, scale 1:100 000, 2002
Satellite Image—Trout Lake Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3504, scale 1:100 000, 2002
Satellite Image—Lake St. Joseph Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3506, scale 1:100 000, 2002
Satellite Image—Lake St. Joseph Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3507, scale 1:100 000, 2002
Perrault Falls Area High Density Regional Lake Sediment Geochemical Survey, Northwestern Ontario: Operation Treasure Hunt	Ontario Geological Survey	Ontario Geological Survey, Open File Report 6092†. 84p., 2002
Precambrian Geology of McNeil, Robertson, Hincks and Cleaver Townships	Jensen, L.S.	Ontario Geological Survey, Open File Report 5931, 77p., 2002. Accompanied by OFM 204 and OFM 236
A Study of Indicator Minerals for Kimberlite, Base Metals and Gold: Kasabonika, Ontario	Stone, D.	Ontario Geological Survey, Open File Report 6089†, 32p., 2002
Precambrian Geology of Kitto, Eva, Summers, Dorothea and Sandra Townships, Northwestern Ontario: Phoenix Bedrock Mapping Project	Hart, T.R., terMeer, M. and Jolette, C.	Ontario Geological Survey, Open File Report 6095, 206p., 2002. Accompanied by Map P.3512, P.3513 and P.3514
Kabinakagami Lake Area High Density Regional Lake Sediment and Water Geochemical Survey, Northern Ontario	Jackson, J.E.	Ontario Geological Survey, Open File Report 6098†, 90p., 2002

Title	Author	Type and Year of Publication
Satellite Image—Opasquia Lake Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3472, scale 1:100 000, 2002
Sateliite Image—Opasquia Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3473, scale 1:100 000, 2002
Satellite Image—North Spirit Lake Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3480, scale 1:100 000, 2002
Satellite Image—Carroll Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3503, scale 1:100 000, 2002
Satellite Image—Trout Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3505, scale 1:100 000, 2002
Satellite Image—Miminiska Lake Area Southeast, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3509, scale 1:100 000, 2002
Precambrian Geology Compilation Map—Michipicoten Sheet	Johns, G.W. and McIlraith, S.	Ontario Geological Survey, Map 2669, scale 1:250 000, 2002
Toward a New Metamorphic Framework for Gold Exploration in the Timmins Area, Central Abitibi Greenstone Belt	Thompson, P.H.	Ontario Geological Survey, Open File Report 6101, 51p., 2002
Geology and Tectonostratigraphic Assemblages, Western Wabigoon Subprovince, Ontario	Sanborn-Barrie, M., Skulski, T., Percival, J.A., Whalen, J.B., Brown, J.L. and McNicoll, V.	Ontario Geological Survey, Preliminary Map P.3446, scale 1:250 000, 2002
Geology and Tectonostratigraphic Assemblages, North-Central Wabigoon Subprovince, Ontario	Percival, J.A., Whalen, J.B., Tomlinson, K.Y., McNicoll, V. and Stott, G.M.	Ontario Geological Survey, Preliminary Map P.3447, scale 1:250 000, 2002
Geology and Tectonostratigraphic Assemblages, South Central Wabigoon Subprovince, Ontario	Stone, D., Tomlinson, K.Y., Davis, D.W., Fralick, P., Hallé, J.,Percival, J.A. and Pufahl, P.	Ontario Geological Survey, Preliminary Map P.3448, scale 1:250 000, 2002
Geology and Tectonostratigraphic Assemblages, Eastern Wabigoon Subprovince, Ontario	Stott, G.M. Davis, D.W., Parker, J.R., Straub, K.J. and Tomlinson, K.Y.,	Ontario Geological Survey, Preliminary Map P.3449, scale 1:250 000, 2002
Precambrian Geology, Firesteel River Area	Stone, D., Hallé, J. and Metsuranta, R.	Ontario Geological Survey, Preliminary Map P.3519, scale 1:50 000, 2002
Precambrian Geology, Pakashkan Lake Area	Stone, D., Hallé, J., Metsuranta, R. and Petersen, N.	Ontario Geological Survey, Preliminary Map P.3520, scale 1:50 000, 2002
Aggregate Resources Inventory of the Echo Lake to Batchawana Bay Area	Rowell, D.J.	ARIP 176, 50p., 2002. Accompanied by 3 maps* ARIMs 176-1A, -1B, -2
Summary of Field Work and Other Activities 2002	Baker, C.L., Debicki, E.J., Kelly, R.I. and Parker, J.R.	Ontario Geological Survey, Open File Report 6100, 353p., 2002
Satellite Image—Opasquia Lake Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3464, scale 1:100 000, 2002
Satellite Image—North Caribou Lake Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3482, scale 1:100 000, 2002
Satellite Image—North Caribou Lake Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3490, scale 1:100 000, 2002
Satellite Image—Miminiska Lake Area Northwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3500, scale 1:100 000, 2002
Satellite Image—Miminiska Lake Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3508, scale 1:100 000, 2002
Satellite Image—Fort Hope Area Southwest, Northwestern Ontario	Singhroy, V.H., Barnett, P.J., Assouad, P., Molch, K. and Leney, S.J.	Ontario Geological Survey, Preliminary Map P. 3510, scale 1:100 000, 2002
Residual Magnetic Field Contours and EM Anomalies with Keating Coefficients, Timmins Area	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 728 - 81 736, scale 1:20 000, 2002
Residual Magnetic Total Field and Electromagnetic Anomalies, Pamour, Ontario; NTS 42A/11	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 737, scale 1:50 000, 2002
Shaded Magnetic Second Vertical Derivative with Keating Coefficients, Pamour, Ontario; NTS 42A/11	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 738, scale 1:50 000, 2002
Apparent Conductance with Electromagnetic Anomalies, Pamour, Ontario; NTS 42A/11	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 739, scale 1:50 000, 2002

Title	Author	Type and Year of Publication
Magnetic Decay Constant (TAU) with Electromagnetic Anomalies, Pamour, Ontario; NTS 42A/11	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 740, scale 1:50 000, 2002
Residual Magnetic Total Field and Electromagnetic Anomalies, Kamiskotia Lake, Ontario; NTS 42A/12	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 741, scale 1:50 000, 2002
Shaded Magnetic Second Vertical Derivative with Keating Coefficients, Kamiskotia Lake, Ontario; NTS 42A/12	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 742, scale 1:50 000, 2002
Apparent Conductance with Electromagnetic Anomalies, Kamiskotia Lake, Ontario; NTS 42A/12	Dumont, R., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 743, scale 1:50 000, 2002
Magnetic Decay Constant (TAU) with Electromagnetic Anomalies, Kamiskotia Lake, Ontario; NTS 42A/12	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 744, scale 1:50 000, 2002
Residual Magnetic Total Field and Electromagnetic Anomalies, Manning Lake, Ontario; NTS 42A/13	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 745, scale 1:50 000, 2002
Shaded Magnetic Second Vertical Derivative with Keating Coefficients, Manning Lake, Ontario; NTS 42A/13	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 746, scale 1:50 000, 2002
Apparent Conductance with Electromagnetic Anomalies, Manning Lake, Ontario; NTS 42A/13	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 747, scale 1:50 000, 2002
Magnetic Decay Constant (TAU) with Electromagnetic Anomalies, Manning Lake, Ontario; NTS 42A/13	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 748, scale 1:50 000, 2002
Residual Magnetic Total Field and Electromagnetic Anomalies, Buskegau River, Ontario; NTS 42A/14	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 749, scale 1:50 000, 2002
Shaded Magnetic Second Vertical Derivative with Keating Coefficients, Buskegau River, Ontario; NTS 42A/14	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 750, scale 1:50 000, 2002
Apparent Conductance with Electromagnetic Anomalies, Buskegau River, Ontario; NTS 42A/14	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 751, scale 1:50 000, 2002
Magnetic Decay Constant (TAU) with Electromagnetic Anomalies, Buskegau River, Ontario; NTS 42A/14	Dumont, R.., Coyle, M., Oneschuk, D. and Potvin, J.	Ontario Geological Survey, Map 81 752, scale 1:50 000, 2002

* Also released in digital form
† Geochemical data/chemical analyses/appendices available in digital form

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Mines and Minerals Information Centre—2002

PART 2

"SUPER FLOW-THROUGH" MAPPING PROJECT

PRELIMINARY FINDINGS

by

W.J. McGuinty

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MINES AND MINERALS INFORMATION CENTRE, TORONTO—2002

Part 2: "Super Flow-Through" Mapping Project—Preliminary Findings

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INTRODUCTION

The year 2002 marked the second full year of operation for specialized, personal tax-based incentives created to directly support investment in high-risk mineral exploration projects. The Industry Liaison Geologist (ILG) began to observe exploration finance activities by Ontario explorers in 2001 to determine whether federal and provincial tax credits in general and the Ontario Focused Flow-Through Share tax credit in particular were having an impact on exploration investment in the province. The study has concentrated on identifying Ontario explorers and collecting information about their capital raising and exploration activities.

In addition to this research, the ILG also began participating in a study of exploration tax incentives as a member of a subcommittee of the Intergovernmental Working Group of the Canadian Mines Ministers (IGWG). This group included representatives of the governments of British Columbia, Saskatchewan, Manitoba, Ontario and Québec as issuers of provincial tax credits for exploration, along with Natural Resources Canada and the Canada Customs and Revenue Agency, representing the federal Investment Tax Credit for Exploration. The Yukon, Northwest Territories and Nunavut also participated. The ILG contributed Ontario observations and recommendations to a report tabled by the IGWG subcommittee at the Canadian Energy and Mines Ministers Conference in September 2002. Those recommendations are included in this report.

FLOW-THROUGH SHARES

Flow-through shares are sold under special agreement between exploration companies and investors. The company issues these shares and agrees to "flow through" eligible exploration expenses to the investors who may then report these as deductions to reduce their taxable income. For the past decade, flow-through share investors resident in Ontario have received these tax deductions at a rate equivalent to 100% of their investment, provided funds invested were spent on eligible exploration activities in Canada as defined by the Canada Customs and Revenue Agency. This tax measure is used to develop private sector support for short-term, high-risk investment where traditional corporate tax measures, such as deductions against income for companies, cannot be used. In the case of the flow-through issuer it is generally the case that the company has more expenses to deduct than offsetting income.

In addition to the deduction, the investor receives common shares issued by the company. Once issued, these shares behave the same way as any common share of the company and become tradable under the same regulatory conditions. The difference for personal income tax purposes, however, is that the adjusted cost base of the flow-through share is considered to be zero. For a regular common share, the purchase price and the cost to acquire and then sell the share (adjusted cost base) are deducted from the sale price for the calculation of capital gains. Even a lower resale price than the original flow-through share purchase price can have capital gains consequences elsewhere in the investor's personal income tax statement.

In recent years, grassroots exploration financing has dropped to very low levels and both industry and government have studied how to enhance the flow-through investment tool. Ontario was the first Canadian jurisdiction to make new improvements in support to sustained mineral exploration investment by including a flow-through enhancement in the Ontario spring 2000 provincial budget. The budget announced a 30% tax deduction for Ontario investors investing in companies conducting Ontario exploration projects. In late 2000, the Canadian federal government responded as well, announcing a new 15% federal *Investment Tax Credit for Exploration (ITCE).* Ontario subsequently converted its deduction plan to the five per cent (5%) *Ontario Focused Flow-Through Share Tax Credit* to harmonize tax provisions and simplify the tax process for the mineral exploration investor. Other regional incentives in British Columbia, Saskatchewan and Manitoba were subsequently offered. Québec has long maintained a high flow-through investment incentive. These enhanced shares have been dubbed *"Super Flow-Through"* by the Prospectors and Developers Association of Canada (PDAC).

For investors in Ontario-based exploration flow-through share financings completed after October 18, 2000, the new Federal tax credit is nonrefundable and is available for 3 years, ending in December 2003. The Ontario tax credit is refundable and has no assigned sunset date.

RATIONALE FOR STUDY

The most comprehensive database of exploration tax credits related to flow-through financing information is collected by the Canada Customs and Revenue Agency (CCRA) and is supplied by companies issuing flow-through shares. This information is the basis of all tax deductions and "super" credits to be claimed by flow-through investors. In order to obtain confirmation of all flow-through tax deductions and credits which might be claimed, CCRA requires companies to submit Flow-Through Share Information forms (T-100) and Statements of Renunciation of Exploration Expense (T-101 Sup.). This information can then be verified against an individual's tax claims when filed. Since all flow-through share issuers must report their subscription details, all flow-through deductions and credits which could be claimed exist in this central database. However, because this information is intrinsically tied to individual taxpayers' tax filings and protected by privacy laws, the information cannot be released by federal or provincial tax/revenue agencies in its raw form. Some other means to measure and qualify the effects of these credits was deemed necessary in order to provide guidance to the provincial government when reviewing its taxation and investment incentive programs.

The intent of MMIC's super flow-through mapping project is to create a database that documents flow-through financings completed by companies active in Ontario during the current 3-year period that federal and provincial "super" tax credit enhancements are applicable. The financial information collected will be "geo-referenced" to permit generation of a map showing potential investment distribution across the province. The spatial component of the database will be generated from current property ownership as related by public disclosure from the companies. The outcome will be annual information that documents

- The number of companies having mineral exploration assets in Ontario;
- The number of companies at work here using the flow-through financing mechanism;
- The number of companies using other securities instruments which may finance exploration;
- Individual amounts raised pursuant to flow-through and other equity financing arrangements;
- Aggregate amounts of flow-through and other equity raised; and
- The number and geographic distribution of exploration projects identified by companies where these funds might be targeted.

DATA ACQUISITION

In May 2001, an initial review was conducted of the System for Electronic Document Analysis and Retrieval (SEDAR) operated by the Canadian Securities Administrators (CSA) and the Canadian Depository for Securities (CDS). The site functions as a gateway to make Canadian public securities filings easily accessible to the interested public. All SEDAR posted press releases from the launch date of the federal Exploration Investment Tax Credit on

October 18, 2000, to April 30, 2001, and reported on the 3 mining subdivisions of SEDAR were reviewed. The 3 SEDAR sections are Gold and Precious Metals; Junior Natural Resources—Mining; and Metals and Minerals—All.

A total of 5380 news releases were issued through these 3 SEDAR divisions during the subject period. These releases were reviewed to determine

a) the nature of the company's activity;
b) principal areas of exploration activity; and
c) announced financing of exploration via flow-through shares.

Approximately 1100 companies issued information about their corporate activities during this period, with approximately 10% indicating some part of their activity was related to exploration in Ontario. During the study, an Active Companies Table was created for publicly traded companies, identifying each by name, SEDAR sub-listing and principal business focus. In the case of companies involved in mineral exploration, principal business focus was defined by the stated jurisdiction in which the company was undertaking mineral exploration. Companies were divided into exploration categories by Canadian Province, United States and Offshore. Companies no longer in the mineral exploration business were identified by their business directions: Change of Business, Oil exploration or Delisted. A category was also developed for companies that can be classified as Not an Issuer. These companies have stated production and/or possible income from operations that would likely encumber the issuing of flow-through shares. One last category, Undefined, has been established for companies which have issued corporate information but have not stated any business direction within the study period.

Corporations with cash flow from operations are more likely to use their exploration deductions to offset income and are therefore less likely to be able to transfer that advantage to a shareholder. However, companies who are producers can issue flow-through shares. Goldcorp, River Gold Mines and Falconbridge are 3 Ontario examples where producers are financing exploration using this vehicle.

During 2001 and 2002, mineral exploration and financing activity for companies exploring in Ontario generated 100 to 115 press releases per month, roughly 12 to 15% of all press releases posted to SEDAR's 3 mining sub-groups. These press releases dealt with announcements, amendments and closing of corporate financings and with acquisition of mineral properties and exploration results. A total of 1375 press releases were collected in 2002 from SEDAR on this basis for reference in the study. Slightly more than 1200 were obtained in 2000–2001. Announcements regarding corporate changes or other regulatory activities were not included in the database.

As of January 15, 2002, the MMIC database of active companies contains the following summary information:

- **1417** companies listed on SEDAR mining subdivisions have reported corporate activities through a press release;
- **1039** companies (73%) state they continue to be involved in mineral exploration as junior exploration companies;
- **670** junior exploration companies state they are working in Canada (65% of exploration companies); and
- **278** stated they have exploration assets in Ontario (41% of Canada). These explorers have reported exploration or acquisition of over 650 Ontario mineral properties as a principal or in a joint venture during the period.

Chart 1-1 illustrates the corporate direction of those companies reporting via press release to SEDAR during the period from October 18, 2000, to December 31, 2002. Chart 1-2 focuses on the distribution of exploration activities by those companies citing exploration as their business focus. A bias has been established towards identifying companies exploring in Ontario to the exclusion of activities they might pursue elsewhere. This bias alone does not

Chart 1-1 **Distribution of reporting public companies on SEDAR mining listings October 2000 to December 31, 2002.**

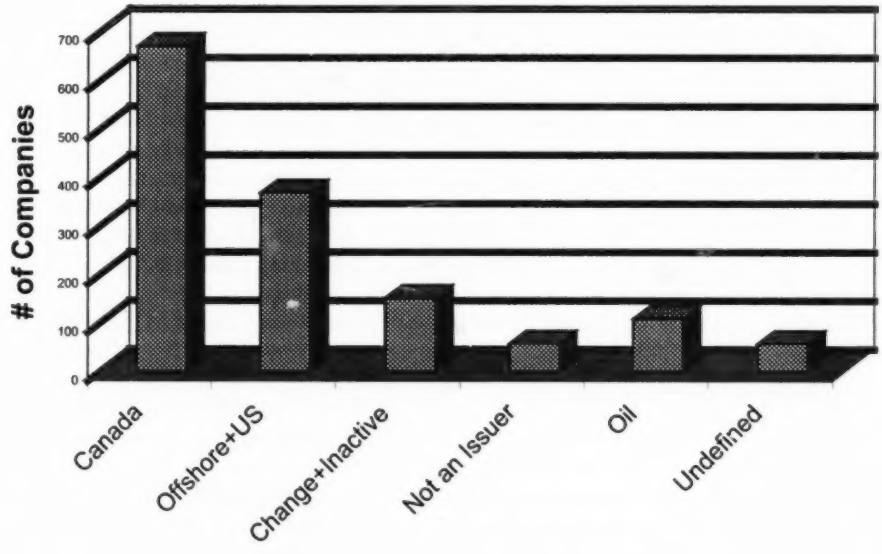
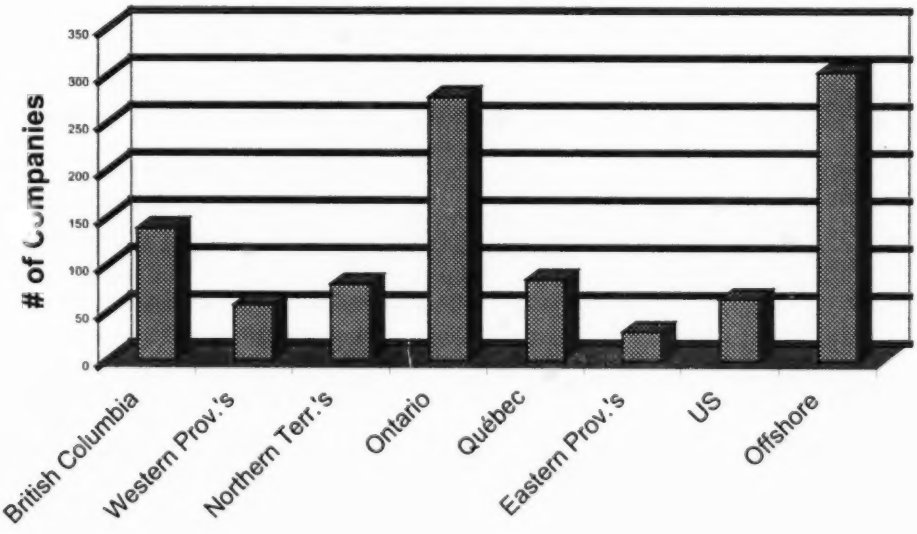


Chart 1-2 **Distribution by geographic region of exploration company activity October 2000 to December 31, 2002.**



cause the high weighting of activity in Ontario as depicted in the chart. More companies report working in Ontario as a principal focus for exploration than any other jurisdiction.

All announced financings by Ontario-identified exploration companies reported on SEDAR are tabulated. Closing dates are recorded from subsequent press releases. The exceptions to this procedure occur when non flow-through funds have a stated destination outside of Canada. In these cases the company cannot blend flow-through capital into its foreign exploration and must dedicate "hard dollars" offshore. Non flow-through equity reported by producers is similarly excluded.

Shares for debt financings are also excluded. Identifying the use of share for debt capital is not explicit in financial reporting and is not likely to represent exploration expenses incurred within the 2001–2002 incentive period until subsequent years. Share for debt funding of 2001–2002 exploration costs may occur in 2002 or 2003 and a method of properly identifying these funds will need to be determined.

Individual financing information tabulated during the past year includes:

Issuing Company	Date Announced	Date Closed
# of Units	Description of units	Description of Warrant
Gross Amount	Flow-through Amount	

Accuracy of Financial Reporting

Flow-through (FT) and combined FT + equity financing details may not be clear in the press release information as the conditions establishing the proportions of the FT component or definition of the type of warrant to be used may depend on an undetermined need of the purchaser at the time of publication. Floating percentages in press releases with no subsequent confirmation of proportions were frequently found, as well as a lack of precision concerning the common or FT nature of warrants. In some cases press releases are not issued to confirm the closing details of a financing or of the exercise of warrants, both of which may potentially cause inaccuracies in the data collected.

Amounts Directed to Exploration in Ontario

Final distribution of FT and common share capital is eventually assigned by the financial officers of the company rather than the explorers. Determining if FT, or hard dollars, or parts of both will go to a given geographic area will depend on the company fulfilling the tax benefits promised to the investors. Hard dollar money may come to an Ontario property because all of the company's FT investors are Vancouver-based and want the benefits of British Columbia's tax credits which would arise from applying FT to work done on the company's BC properties. Because of the bias to capture Ontario explorers, gross financing amounts overstate money that may be focused on Ontario mineral assets.

SUMMARY FINDINGS AND OBSERVATIONS

Data compilation of financings has been completed for 2 periods, from October 18, 2000, to January 15, 2002, as reported in 2002 and for the period of January 1, 2002, to January 15, 2003. Overlapping dates in January of 2002 are used to permit the confirmation of financings that were closed in December 2001 but not reported until the new year. Summary information for the 2000–2001 and the 2002 periods are presented in Table 1-1.

Table 1-1 Ontario flow-through and equity financing for the periods October 2000 to December 2001, as well as 2002 summary observations.

	2000-01		2002	
Approximate number of companies describing exploration projects in Ontario through press release	205		270	
Number of Identified Companies with announced financings	108		176	
Total number of financings identified	269		362	
Number of financings completed by date of review	208		221	
Number of financings not completed by date of review	48		135	
Number of financings cancelled by date of review*	13		7	
Total FT share financing amount		$ 73.5M		$ 90.3M
Total common share financing amount		$ 41.2M		$149.8M
Total financing by identified companies in review period**		$114.7M		$240.1M
Identified Company financings with FT shares only	118	$ 23.3M	18	$ 6.4M
Identified Company financings with common shares only	91	$ 5.1M	114	$ 57.2M
Identified Company financings with a combination of FT and Common shares {FT	45	$ 50.3M	223	$ 83.9M
{Com		$ 36.0M		$ 92.6M

* Only 2 of the Identified Companies (3 cancelled financings) did not succeed during the period.
** Data acquisition period: October 18, 2000, to January 15, 2002.

2001 Findings

Approximately $115 million in equity financing was raised or announced by identified companies exploring in Ontario in 2000–2001. Almost $74 million was raised by flow-through share sales and the remaining $41 million was obtained via sales of common share and other instruments. The total amount falls short of the estimated exploration funds required to sustain mineral deposit discovery as proposed in 2000 by the Prospectors and Developers Association of Canada (PDAC). The PDAC suggested in media communications that a threshold of $350 million in exploration is needed in Canada. With perhaps 40% of companies indicating Canadian activity focused in Ontario, the provincial amount should approximate $140 million.

Of the 205 companies identifying mineral assets in the province of Ontario in the 2000–2001 period, 108 (53%) were found to have announced a financing through SEDAR. This would indicate about half of the companies that could be exploring in Ontario are without funds or spending cash reserves.

Of the 83 companies that raised $74 million in flow-through capital, 5 companies account for $26.9 million, or almost 37%, of total flow-through raised. Two of the 5 are producers. Amounts raised by the 78 other companies are quite variable, ranging from $15 000 to $2 000 000.

Flow-through financing amounts compiled for the period have a median value of approximately $200 000 and a mode of $150 000 indicating that resulting exploration projects would be quite small. The median and mode values for the financings recorded are more representative of the amounts obtained than the average amount, which is about $445 000. The average is strongly affected by several large amounts raised by a small group of companies. To

provide a measure of comparison as to the value of a median-sized financing to an exploration company, $150 000 is approximately equal to expenditures incurred during a modest exploration program in an accessible area of Canada. Such a program might consist of approximately 1500 to 2000 m of core drilling, sampling and supervision lasting 30 to 45 project days.

Eighteen of 79 flow-through issuers attached flow-through warrants to their share offerings. If exercised, these shares will generate an additional $13.7 million, or 12% of the value of the announced financings during the period. Flow-though warrants may be a very useful financing tool as these can be exercised at a future time convenient to the purchaser and to the specific amount required for tax purposes. For the issuer, the added tax appeal of the flow-through warrant may improve the odds of the warrants being exercised and reduce future financing costs. The contribution of these warrants to annual exploration financing may not be reported in a press release because of the small amounts exercised at any given time. Exercise of warrants is dependent upon share price during the period the warrant is offered. Flow-through warrants exercised constitute a new flow-through share offering eligible for super flow-through credits and, if announced through a press release, have been included in the study data.

2002 Findings

In 2002, more than $240 million in equity financing was raised or announced by identified companies exploring in Ontario (up from $115 million in 2001). This amount excludes "hard dollar" equity raised by mine operators and for Ontario explorers with foreign projects as could best be determined. Over $90 million (up from $74 million) was raised through flow-through share and common share financing amounted to slightly less than $150 million (up from $41 million). At the end of the period, the closings of almost $83 million (35% of financings) were unconfirmed by the study data. The amounts would suggest that Ontario may have attracted enough companies and funds to meet its portion of the goal set by the PDAC's suggested annual minimum exploration levels for Canada in 2000.

Of the 270 companies in the pool of Identified Companies, 176 (65%) were successful at raising some form of capital in 2002, an improvement over 2001. Ninety-seven companies raised flow-through capital in 2002, also an increase from 2001. As in the previous year, 5 of these companies, though not the same companies, are responsible for 37% of the total funds raised. Two are producers. The top 10 companies account for over $47 million, or 52.8%, of all flow-through for the group.

It was determined that 23 companies have attached flow-through warrants to their offerings that if exercised, would generate an additional $12.3 million in flow-through funds. It is not clear that these types of warrants are having any impact at this time. Few reports of the exercise of warrants issued in 2001 were issued by press release in 2002. Only one company identified from 2001 data reported exercise of flow-through warrants in 2002 in the amount of $112 000. As previously mentioned, tracking the amounts of flow-through warrants exercised is difficult because the reporting of small amounts via press release may not be deemed relevant by the company.

Several observations can be made in the comparison of 2001 and 2002 financial data. However, the observations need to be considered with other sector factors which have changed in order to provide context. Table 1-2 summarizes financings data for the 2 study periods.

Table 1-2. Summary of distribution of financing amounts.

	Total	Average	Median	Mode
2000-01 Flow-though	$73.5M	$443 500	$200 000	$150 000
2002 Flow-though	$90.3M	$621 420	$250 000	$300 000
2000-01 Hard Dollar	$41.2M	$307 388	$124 125	$100 000
2002 Hard Dollar	$151.3M	$577 982	$201 500	$100 000

The total amount of non flow-through financings obtained by juniors who were exploring in Ontario was the most remarkable feature of the data gathered in 2002. There is a 260% increase in these types of funds announced and/or closed compared with just a 23% increase in flow-through financings. It should be noted that 71% (25% of all the captured financings) that could not be confirmed as closed were for non flow-through shares only.

Both flow-through and non flow-through financing data show higher median values for 2002 over 2000–01, reflecting a general strengthening in the amounts raised. Calculation of the mode for these financings would suggest that companies were more comfortable seeking higher amounts of flow-through in their offerings than non flow-through. The most commonly requested "hard dollar" amount remained at $100 000. Charts 1-3 and 1-4 provide greater detail on the relative sizes of financings captured over the last 2 periods of the study.

The major factor contributing to the increase in operating funds delivered to Ontario explorers in 2002 appears to be the return of strength to the gold sector. Along with announced financings, announced acquisition of gold projects saw a significant increase in 2002 over the previous year. This activity was most prevalent in, but not restricted to, the Red Lake–Birch-Uchi area. As payments for acquisition of exploration properties via staking, option or purchase are not recognized as eligible expenses under Canadian Exploration Expense (CEE) rules which govern flow-through spending, small "hard dollar" financings have been needed to secure land positions.

In addition to gold's resurgence, copper-nickel-PGE exploration has continued to see investor support, particularly in the Sudbury area. Companies such as FNX Mining, Aurora Platinum and Wallbridge Mining have all been successful at financing projects they developed or optioned from the portfolios of the region's predominant players, INCO Ltd. and Noranda/Falconbridge. Falconbridge's exploration success in the area and continued support by large companies for projects conducted by junior companies (e.g., Anglo Platinum Corporation Limited's support for Pacific North West Capital's River Valley PGE project) have also contributed. The combination of active exploration and passive support of juniors by these larger companies through farm-out or option agreements have created a strong focus among investors for exploration in this area.

OBTAINING FLOW-THROUGH TAX INCENTIVES IN THE CURRENT INDUSTRY ENVIRONMENT

The majority of press releases about flow-through share and other equity financings captured by the Ontario flow-through study in 2002 state that these have been undertaken as private placements or offering memoranda between individual purchasers and the issuing company. Of 364 financings captured, 333 (92.5%) were private placements. Few of the press releases recognize financings as being completed through offering types which allow investment to be managed or distributed by a third party. Why are companies using these exempt mechanisms rather than offerings such as a prospectus to effect larger financings?

Private placement investments, including those for flow-through shares, occur in what securities regulators define as the Exempt Market. In this segment of the securities markets, exemptions permit companies to avoid full technical and corporate reporting requirements for a prospectus (and the associated cost burden), thus permitting sale of shares directly to sophisticated or knowledgeable investors, insiders of the company, family members and other specifically defined investors. The exempt market process does not reduce a company's responsibility to provide complete disclosure, only the level of scrutiny it is provided. The numbers of investors eligible under certain exemptions (Ontario, Closely Held Issuer Exemption) are limited or the amounts of funds that can be raised may have lifetime caps (Ontario, former Seed Capital Exemption). In addition, some investors have minimum investment limits or must meet financial suitability tests. Ontario, British Columbia and Alberta have all established the Accredited Investor rule. British Columbia and Alberta have 2 other investor risk levels using the $97 000 rule and a new offering memorandum rule.

Chart 1-3 Distribution of Identified Equity Financings by Ontario explorers 2000–01.

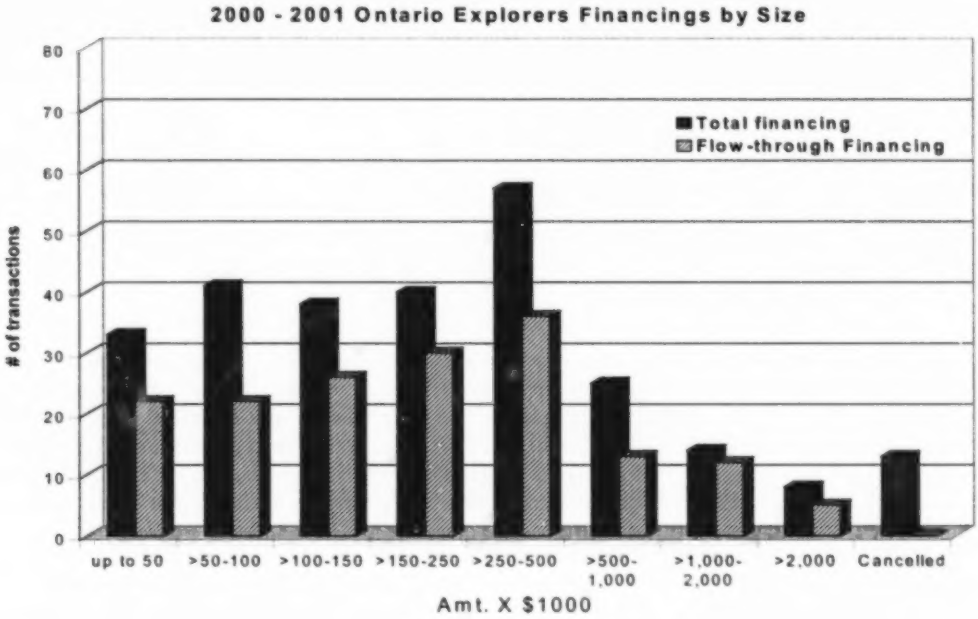
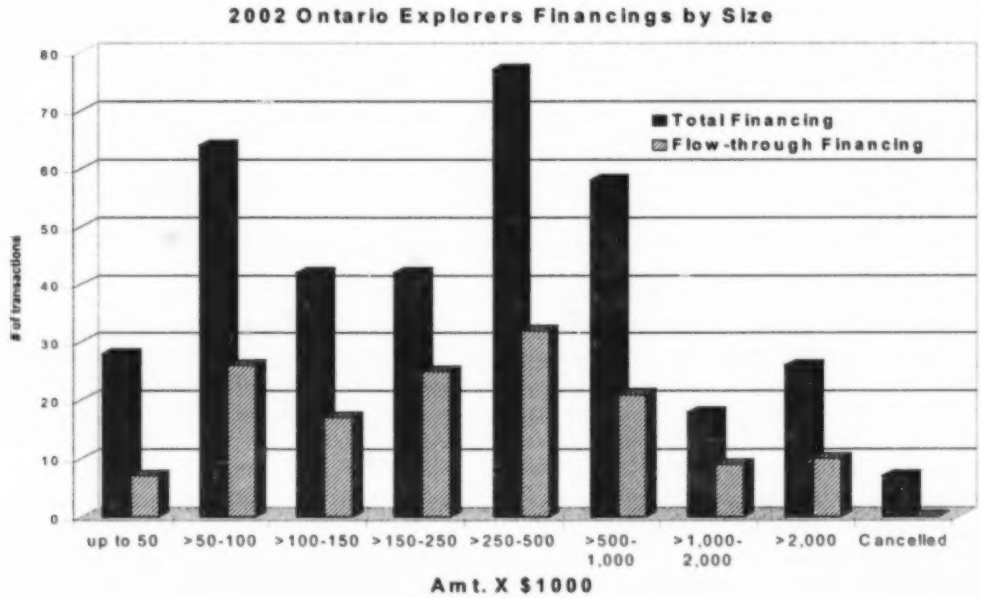


Chart 1-4 Distribution of Identified Equity Financings by Ontario explorers 2002.



The Government Incentive (GI) Exemption in Ontario also limits sale of flow-through shares in a single offering to 50 purchasers. There is however no upper or lower limits to the amounts negotiated with an individual shareholder. In this respect, flow-through shares are one of the few exempt market investments available to Ontario-resident middle-income investors wishing to make an investment of any size. To proceed with a privately placed flow-through financing under this exemption, the company essentially creates an offering memorandum. This document emulates disclosure provided in a prospectus, offering the investor the fullest range of information possible on the company and its exploration assets but without the attached due diligence burden of a prospectus. No similar specific exemption exists in Alberta and British Columbia but flow-through shares can be sold through the capital raising rules mentioned previously. These are set out in Multilateral Agreement 45-103 of the British Columbia and Alberta Securities Commissions.

Why use these mechanisms when they are so limiting? Comments from companies who have raised capital in the past 26 months identify 3 main reasons: opportunity, demand and cost.

Opportunity appears to be limited by both time and perceived quality of assets. Particularly in the case of flow-through shares, opportunity is framed by the investor's realization of his or her tax situation and the maximum deadline for seeking relief from it. An exploration company's time to find the investor and generate an approved agreement may range from several weeks to 2 or 3 months. The preparation time for a prospectus and the time required for due diligence of the contained information by regulatory authorities can be much greater and normally precludes this avenue. A delay outside of the tax avoidance window or simply the availability of a similar investment may send the investor elsewhere and provide no reward to the company for expenditure of working capital in preparing financial instruments. Exempt private placements allow the flow-through issuer to "hit the tax window" or the target investors interests more accurately.

With regard to perceived quality of assets, some good exploration properties will not yet merit full technical reporting or an updated independent report or the company may not be able to afford one. Private placements allow a company to highlight both properties to investors, but may also discount their value and influence the amount they wish to invest. The perceived discounted value of properties with unqualified technical reports may also keep investment funds and formal securities companies away from exempt placements.

Demand for exploration company securities also drives the form of equity financing used. It is assumed that investors in flow-through shares consider the eventual resale of their holdings in their purchase deliberations. It is also reasonable to assume that current share liquidity will affect their confidence in future market activity and their ability to resell their shares. A company's interest in risking capital to raise more capital will similarly be influenced by the overall trading activity within its peer group. Companies respond to higher investor demand and confidence with more financially risky share offerings geared to higher subscriptions. The lower the demand in the public at large, the more useful exempt financings personalized to specific investors become.

A key reason to install flow-through tax credit incentives in 2000 was the perception of lack of financing strength in the mining sector. It was the opinion of the junior exploration community and related government agencies that investors needed a "tax nudge" to reinvest. The speculative return from resale of enhanced flow-through shares in a slow securities market should not be disregarded as an encumbrance when evaluating the success of the tax credit incentives.

Costs or management of costs dominates the use of small treasuries. Many companies identified in the study appeared able to complete small, low-cost financings in the Exempt Market. These financings could prepare the company for larger financings through debt clearance, qualifying reports and legal reviews for prospectuses, or in the case of flow-through exempt placements, conduct small programs on key properties as a means of improving the company's asset base.

RAISING AND ATTRACTING FLOW-THROUGH TO ONTARIO

A conclusion about the success of the Ontario Focused Flow-Through Share (OFFTS) tax credit program is not necessarily satisfied by knowing how many companies and taxpayers in Ontario have taken advantage of the tax opportunity. This is the empirical information that the Minister of Finance for Ontario will have for review annually. A fuller conclusion about the effectiveness of the credit can come from including an understanding of whether the advantage is obtainable by the targeted group of Ontario investors when they have made the decision to invest in Ontario exploration. A series of questions determines the effectiveness of the provincial credit:

- Can the Ontario investor buy flow-through shares offered for funding Ontario exploration?
  Given the dominance of the exempt market in announced financings, willing investors looking to invest directly would have to actively search for a specific company investment opportunity or would have to be approached by the issuing company. These types of share transactions discourage "ripple effects" in the market as might be expected by more visible investment opportunities such as prospectuses.

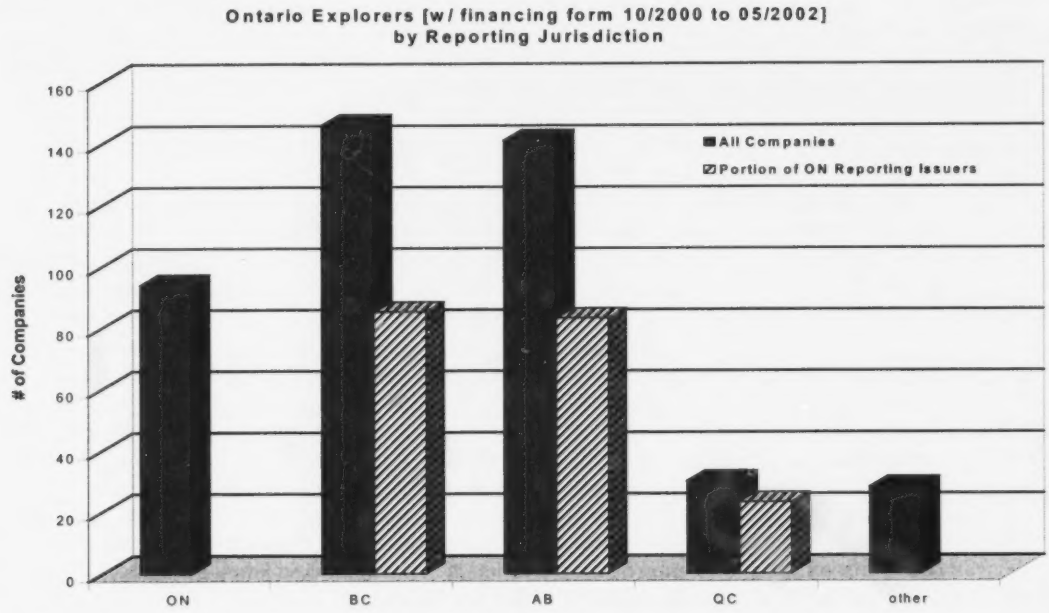
- Can the Ontario investor buy flow-through shares offered for funding Ontario exploration with the OFFTS as part of the flow-through agreement?
  Once the Ontario investor and the flow-though issuer have found each other, they must then decide, either jointly or separately, if the investment should qualify for the Ontario tax credit. If the company has exploration assets in several provinces, one or both parties may not wish to constrain funds to one jurisdiction if a project in another merits more work or could bring better share value at resale. The participants in the agreement may forgo all or part of Ontario's offer to reward Ontario exploration for the sake of retaining full discretion on the allocation of their exploration funds. Similarly, an investment fund may draw investors from many jurisdictions in Canada and may limit their responsibility to deliver the OFFTS or other provincial credits, offsetting this loss of tax benefit with a stronger portfolio of projects nationally for its unit holders

- Can the exploration company sell its flow-through shares to fund Ontario exploration to the Ontario investor?
  To effect the sale of shares of capital stock to potential shareholders in a jurisdiction such as Ontario, provincial securities rules generally require that the company be a "reporting issuer" in that province. Reporting issuers should not be confused with listed companies trading on stock exchanges. Reporting issuers provide information about the company and its activities to the provincial securities agency in sufficient amount and quality as to offer a reasonable level of protection to direct investing residents in that jurisdiction. The Accredited Investor exemption does allow Ontario investors to invest in companies who do not report to the Ontario Securities Commission and possibly obtain the OFFTS credit.

  Chart 1-5 depicts the relationship of companies identified as Ontario explorers who have financed their operations in the 20 months preceding May 2002 to the regulatory jurisdictions in which they report. Of the 151 companies identified, 94 (62%) are reporting issuers in Ontario. By contrast 97% of Ontario explorers report to the British Columbia Securities Commission and 93% report in Alberta. It would appear that without available exemptions, almost 40% of the companies exploring here could not market their flow-through shares in Ontario without first completing significant representations about their company to the Ontario Securities Commission. Larger prospectus offerings of flow-through and other equities by companies hoping to reach the general investing public in Ontario would require that they eventually be reporting issuers here.

  Taken in another light, more than 95% of the companies exploring in Ontario, including virtually all the companies that are reporting issuers in Ontario, can access capital in western Canada. It is not clear from the financing information gathered to date how heavily dependent Ontario explorers are on capital coming from British Columbia and Alberta, or whether Ontario reporting issuers are preferentially using more risk-

Chart 1-5 Ontario explorers by reporting jurisdiction.



tolerant securities rules in these jurisdictions, such as the new Offering Memorandum Exemption in Multilateral agreement 45-103.

- Are certain purchasers of flow-through excluded from the OFFTS?
  By design certain classes of investors were excluded from receiving the ITCE and related provincial tax incentives. The reason for this exclusion was primarily based in the late 1980s experience with the range of tax sheltering vehicles developed and marketed for investors to avail themselves of the expanded Mineral Exploration Depletion Allowance incentives of that period. The period generated a significant number of investors who were attracted only by tax incentives and who ignored or did not understand how noncompliance with Canadian Exploration Expense rules could latterly affect their flow-through deductions.

  Unfortunately, the removal of these classes of investors from ITCE benefits has excluded major mining corporations in Canada from participating in the program. In the previous period of flow-through tax incentives, when the Mineral Exploration Depletion Allowance (MEDA) was available to investors, mining companies such as Teck Corporation (now Teck Cominco), Hemlo Gold Mines (now Newmont) and other Canadian producers funded mineral exploration by junior exploration companies using flow-through investments. Not only were these major companies significant sources of funding for companies they supported, their investments were also viewed as an endorsement of exploration sector activity for the juniors involved and the commodities that they explored for in general.

  There has been considerable change in the global structure of large mining corporations since the late 1980s and these companies have become more commodity focused and less anchored to their Canadian assets. They also have the added benefit of a globally dispersed junior exploration community with roots in the Canadian stock markets. It is difficult to predict a level of renewed major company interest if the ITCE and provincially enhanced flow-through investments were available to them, but their exclusion does not attract them as a class of potential major investors to Canada.

INTERIM CONCLUSIONS

The 26-month study has identified 270 companies with over 650 Ontario exploration assets as part of their grassroots exploration portfolio. Part of this group has raised or is raising over $170 million of flow-through financing and over $181 million of non flow-through "hard dollar" capital. Despite this level of activity there is little specific information with which to evaluate factors governing investor choices and draw substantive or detailed conclusions concerning the overall importance of federal and provincial tax credits to exploration investment in Ontario. Investors, whom it was hoped would find the new tax credits attractive, have not returned in volume to grassroots exploration in Ontario. The increase of small working capital financings in 2002 may indicate that conditions are improving.

Access to flow-through financing from the junior mining companies' perspective has been challenged by their general financial condition and that of the resource equities market. A lack of familiarity with the implications of recent changes to securities regulations, changes to the profile of investors and a slow return by institutional investors and brokers to the resource sector are evidence that capital markets were unprepared for the launching of time-limited, flow-through financing incentives. In addition, there would seem to be some lingering ill feelings about flow-through enhancements from the MEDA years. Resolution of some of the flaws with respect to treatment of flow-through investments made by Customs and Revenue Agency of Canada in the mid 1990s does not appear to have been successfully promoted to potential buyers.

Attraction to enhanced flow-through share incentives from an investor's perspective has also been hampered by lack of flagship or marquee commodities they understood until the recent resurgence in gold price and related exploration. The absence of institutions and brokers who by their focus and analysis could create leadership in this part of the equities market has also contributed to the slow rate of increase in investment.

While the financing levels envisioned by industry associations and governments have not met the expectations, they have survived major economic and investor confidence crises that have affected financial markets. These include the economic downturn in the United States, the conservative response to terrorist attacks of September 11, 2001, and the collapses of Enron and other major corporations. Although the Ontario study cannot specifically quantify the impact of the ITCE and OFFTS tax credits, it seems clear that these instruments have protected and enhanced the financing base for grassroots exploration to some degree during this period.

With regard to the OFFTS tax credit several companies have made specific reference in press releases to using it in their placements of flow-through shares. Still others have made reference to using the Ontario specific government incentive exemption in sales of flow-through to Ontario investors who will presumably pursue the credit for eligible exploration expenses from these financings. The majority of public information on flow-through financings is silent as to whether investors are being offered the Ontario (or other provincial) credit or if it is being included in their agreements with exploration companies.

There is evidence that flow-through financing used in Ontario is raised elsewhere in Canada from non-Ontario investors. In these cases issuers of flow-through and buyers are relying on the federal ITCE to enhance their investment opportunity and forgoing not only an Ontario credit but a provincially specific incentive they might obtain in their home province. This apparent "opting out" of the provincial credits would support the view that investors are still placing value on selected assets rather than simply on obtaining maximum tax avoidance. This situation should be of comfort to both levels of government: a federally sponsored tax credit that attracts funding for grassroots exploration across the country and a provincial tax credit that rewards local investment without the incentive being a factor which competes with good business decision-making based on the merits of mining assets.

There are securities regulations in each of the major provincial jurisdictions where grassroots explorers operate their businesses that provide for ease of distribution of flow-though shares to their investors. This guarantees a reasonable measure of success at the federal level for the ITCE and, to some degree, the OFFTS tax credit in Ontario. The securities rules under which these same companies have issued other forms of equity vary substantially from province to province. As result, a company may tend to cultivate investors where it can best meet all its capital

needs. Ontario investors may not receive the opportunity to invest in a flow-though financing where both the ITCE and the OFFTS could be used because the company and the Ontario investor are unaware of each other.

RECOMMENDATIONS FOR IMPROVING THE FLOW-THROUGH TAX CREDIT MECHANISM

At the 2001 Mines Ministers' Conference (MMC), a working group was created under the auspices of the Intergovernmental Working Group on the Mineral Industry (IGWG) to report to the 2002 MMC on the effectiveness of the federal and provincial/territorial tax credits for exploration and to provide recommendations on existing and potential tax incentives for mineral exploration. The working group comprises representatives from the governments of Quebec, Ontario, Manitoba, Saskatchewan, British Columbia, Yukon, Northwest Territories and Natural Resources Canada. The objectives of this working group are:

- to accumulate available information on mineral exploration spending, particularly on money raised using flow-through shares linked to the ITCE and provincial tax credits;
- to analyze the information and evaluate the performance of the ITCE in terms of stimulating investor interest and increasing mineral exploration investment;
- to evaluate possible options for improvement or replacement of the ITCE; and
- to recommend a course of action after the planned termination date of the temporary measure.

The working group submitted its preliminary report to Canada's Mines Ministers at their 2002 conference in Winnipeg, Manitoba. A revised edition of the report for the attention of the federal and provincial/territorial departments of Finance was prepared at year's end.

The working group made 2 key recommendations in its report:

1. **The ITCE program and the harmonized provincial tax credits should be extended to December 31, 2004, with consideration given to a further year extension.**
2. **The spending period for carrying out the exploration work should be extended until 1 full year after the program's proposed closing date.**

Other proposals and recommendations suggested by working group members and by organizations such as the PDAC were also reviewed. The working group was not able to sufficiently study some of these proposals and has resolved to study them further. In other cases, proposals were deemed to affect the flow-through mechanism beyond the scope of the tax-credit study and were recommended for evaluation by a more appropriately defined committee. The report to the Canadian Mines Ministers is available at www.nrcan.gc.ca/mms/efab/work/en/itce_evaluation_report_en.pdf

ONTARIO RECOMMENDATIONS

Information gathered during the Ontario flow-through incentives study was used as a basis for Ontario recommendations submitted to the IGWG subcommittee. These recommendations were patterned to address recommendations made by the PDAC in early 2001 to the federal and provincial Ministers of Finance. The recommendations also suggest several areas for further research.

Extension of the ITCE Program

The goal of participating governments was to provide a quick response to the green-fields exploration crisis in Canada by creating investor interest. Almost half of the fixed ITCE incentive period has passed in a struggle to meet its forecast outcome. Rather than an inherent problem in the incentive, the expected amounts of flow-through to be raised have been hobbled by the more deeply rooted weakness of eligible companies in the current financial market place. With some recent strengthening of metals pricing and growing familiarity with new securities rules both investors and companies may be able to start using this enhanced mechanism at levels initially envisioned. It is recommended that the federal ITCE be extended for an additional 1 to 2 years in anticipation that investor interest will meet federal and provincial governments' expected investment targets for the program.

Extension of research into challenges and benefits of raising ITCE enhanced capital

The *Ontario Focused Flow-Through Share* tax credit program appears to have suffered from the inability of the targeted junior exploration community to attract investors. Because of the increased local focus of the OFFTS tax credit it may take more time for companies and investors to fully understand and appreciate their use. As with the ITCE, the lower than expected uptake for the Ontario tax credit should be viewed in the context of other market factors and as a learning curve for investors rather than an inefficiency of the tax credit system. It is recommended the underlying factors affecting success of the program be further studied. The Ontario flow-through study has identified over 150 companies that, to date, have obtained financing within the time frame of the ITCE and OFFTS programs. These companies should be approached for assistance in determining what factors are limiting their access to flow-through capital and using the OFFTS and ITCE.

Extension of the Current ITCE Deadline for Expenditures

In addition to the suggested extension of ITCE into the future, the PDAC suggested that the current program adjust its sunset date to accommodate the expenditure rules established by flow-through provisions. Currently, flow-through rules allow companies to renounce the 100% deduction to the investor and make expenditures with those funds to the end of the subsequent calendar year. For the years 2000, 2001 and 2002 this same provision will apply to investors claiming the ITCE credit. For 2003, however, the credit for flow-through amounts raised will apply only to the funds expended in 2003, while the normal 100% deduction will receive its normal treatment. For purchasers in the last year of the program, their interest in investing will progressively diminish as the guarantee that the company can effectively spend their funds to meet the December 31st ITCE deadline becomes less certain. This deadline could effectively kill the operation of the incentive within the last quarter of 2003, the last tax credit buying opportunity in the current program. It is recommended that the current ITCE program be amended to allow spending that is eligible for the credit to be extended into 2004 and follow the normal flow-through pattern for CEE deductions.

Extension of ITCE and OFFTS tax credits to eligible mining companies

At this time, tax credit enhancements to flow-through shares are available only to individuals for use against personal income tax owed. During the MEDA enhanced period of the 1980s, a group of corporate entities including mining companies could also obtain the added benefits through flow-through purchases. The broad definition of corporations that could avail themselves to MEDA flow-through funds available during that era created a considerable amount of overheating among investors. Demand for MEDA flow-through shares led to complex investment structures to service demand and resulted in a noticeable number of tax claw backs through government audit with the inevitable harsh reaction from tax investors.

The leadership role that major mining companies could play in the Canadian exploration investment scene should be cause for their inclusion in the current and future tax credit programs. Mineral development opportunities available globally to Canadian mine operators now spread mid-level deposit development funding very thinly across the globe.

Drill definition stage exploration programs beyond the pure grassroots level could benefit from joint ventures funded by major companies attracted by the tax reductions offered by the ITCE and OFFTS. It is recommended that the Inter-Governmental Working Group of the Mines Ministers Conference and the Canada Customs and Revenue Agency attempt to redefine eligible investors for ITCE credit to include investments made by corporations that are readily defined as mining companies.

Inclusion of certain new expense categories within CEE definitions.

The PDAC has recommended that costs related to raising flow-through capital be accepted and part of the expenses described as CEE, enabling some of the cost burden of acquiring this capital to be offset by the investor. The Ontario government does not support this recommendation. Although perhaps further exacerbated by CEE definitions, "cost of capital" is a securities market issue that is not restricted to mineral explorers financed by flow-through shares. It is currently seen as a general problem in the venture capital market and in particular within those using flow-through type mechanisms. Ontario does agree that the exploration sector is under pressure from new costs and that including exploration-specific expenses not currently part of CEE definitions would better serve explorers.

Over time, exploration technology and evaluation methodologies for mineral commodities change as with other technology-based industries. In large measure the provisions of CEE are sufficiently flexible to accommodate changing physical exploration costs. In the past decade, however, new costs to exploration related to industry-wide sustainable development goals are reaching the grassroots explorer. Many companies are incurring, often at the urging of various levels of government, broader environmental and social investment costs from property acquisition onwards.

One example of new costs often identified by junior explorers are those related to extra-constitutional communications and consultations with First Nations such as travel, meeting and possible legal costs. Based on information gathered by the Ontario flow-through study, almost half of recently raised funds are excluded from use for this purpose and many companies have not been able to raise the non flow-through capital they need for these considerations. It is recommended that the Inter-Governmental Working Group of the Mines Ministers Conference and the Canada Customs and Revenue Agency review eligible expenditure categories within the context of the current exploration environment with a view to including additional costs related to exploration realities in the sustainable development context.

Ontario

Ontario Geological Survey
Regional Resident Geologist Program

Petroleum Resources Centre—2002

by

T.R. Carter

2003

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Petroleum Resources Centre—2002

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PETROLEUM RESOURCES CENTRE—2002

Oil and Gas Exploration and Development Activity in Ontario in 2002

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INTRODUCTION

Oil and gas drilling activity slowed in 2002 due to a lowering of prices late in 2001, which extended into the early part of the year. Prices for both oil and natural gas increased considerably late in the year, due to rapid draw-down of natural gas storage levels in North America as a result of cold winter temperatures, and uncertainties about crude oil supplies due to the strike by oil workers in Venezuela and the possibility of war in Iraq.

EXPLORATION ACTIVITY

Oil and gas drilling activity in Ontario during 2002 declined considerably compared to the previous year. A total of 105 licences to drill and operate new wells were issued by the Ministry of Natural Resources in 2002, compared to 142 in 2001. At the time of writing, drilling was reported to be complete at 82 wells consisting of 27 exploratory wells, 52 development wells, and 3 service wells. Horizontal drilling accounted for 26 of the 82 wells drilled in 2002, continuing the increasing popularity of this technology. The 2002 exploratory drilling resulted in 18 wells reported as gas producers including one private gas well and 1 well reported as an oil producer (Table 1, Figure 1). Development drilling was very successful, with 12 wells reported to be oil producers, 22 as gas producers, 6 as private gas wells and 1 well completed for production of both oil and natural gas. Most of the successful oil wells were completed in Ordovician targets, while completions in Silurian sandstone reservoirs in Norfolk County dominated the gas-producing wells.

Talisman Energy Inc. was the most active exploration company in Ontario's petroleum industry in 2002, with 28 wells drilled. Echo Energy Inc drilled 13 wells and Pifher Resources Inc completed drilling at 11 wells, all in the Silurian sandstone play in Norfolk County. Talisman focussed its efforts on the Ordovician oil play and on sour natural gas pools in Silurian reef targets beneath the waters of Lake Erie.

Ordovician Play: Drilling was reported to be complete at 1 exploratory well and 14 development wells testing Ordovician targets in 2002. The one Ordovician exploratory well, TLM No.1 (Horiz #1) Mersea 2-18-D was reported to be completed as an oil producer on an extension of the prolific Hillman trend.

The Ordovician development drilling resulted in 12 new oil producers with 1 well still under evaluation. Successful oil wells were completed in the Mersea 4-240-STR, Mersea 6-16-B, Mersea 3-6-V (Wigle), Rochester 1-17-II EBR, and Rochester 7-17-IV EBR pools. All of these wells were drilled by Talisman Energy Inc.

Cambrian Play: No wells were drilled to test Cambrian targets for oil and natural gas potential in 2002. General Chemical Canada Ltd drilled 1 well on their property in Anderdon Township to test the Cambrian for its potential to produce high-calcium brines. The well was reported to be a potential brine producer at the time of writing.

Silurian Carbonate Play: There were 8 exploratory tests of Silurian Guelph Formation reef and/or Salina Formation structural trap targets in 2002. Kinetic #5 Sombra 4-2-XIII was completed as a natural gas well in a new pool discovery in the heart of the pinnacle reef belt in Lambton County. REC #13 Aldborough 6-13-IV was reported to

be a potential gas producer and is currently undergoing evaluation. The well is located 800 m north of the Aldborough 4-20-VII gas pool which produces natural gas from a structural trap in the A-1 Carbonate unit of the Salina Formation. The remaining wells were all plugged and abandoned.

There were 13 development tests of Silurian Guelph–Salina formation targets in 2002. Nine wells were drilled on offshore targets in Lake Erie by Talisman Energy Inc to develop natural gas reservoirs in the Morpeth and Silver Creek platform reefs. Five of these wells were either completed for production or reported as potential gas producers. In onshore activity, Clearwood Resources Inc. completed an oil well on an extension of the Becher West oil pool in the Salina A-1 Carbonate unit. 748160 Ontario Inc. completed a well for production of natural gas in the Chatham 6-15-XII pool.

Silurian Sandstone Play: The interest in Silurian sandstone targets continued in 2002, as increasing natural gas prices improved the economics of this basin-centered tight gas play. A total of 17 exploratory and 24 development wells tested Lower Silurian sandstone targets in 2002. Sixteen of the exploratory wells were reported to be gas producers or potential gas producers. Nine of these wells were drilled by Echo Energy Inc. in exploratory extensions of the boundary of the old Bayham gas pool. Rowe Energy Corporation drilled 2 successful gas wells, REC #11 Aldborough 1-21-IV and REC #14 Aldborough 5-22-III, in a new pool discovery southwest of the Townline gas pool. Pifher Resources completed 3 gas wells in an exploratory extension of the Hemlock pool and one additional well in a probable extension of the Bayham pool.

Twenty-three of the development wells were reported as gas producers or potential gas producers. Successful commercial gas wells were drilled in 5 different pools: Hemlock, Bayham, Lincoln, Houghton 5-8-ENR, and the Lake Erie-Maitland pool. Echo Energy and Pifher Resources were the most active companies in the play, accounting for 11 of the new gas wells. Successful wells were also completed by Hemlock Explorations, Talisman Energy, and NRG Corp. Seven other wells were completed as private gas wells in parts of the Lincoln and Haldimand gas fields.

Devonian Play: One exploratory well was drilled to test the Dundee Formation by Borders Exploration Ontario Inc. The well was reported to have encountered a show of natural gas and was plugged and abandoned shortly after reaching total depth.

Preliminary figures for production of oil and natural gas are not yet available.

RECOMMENDATIONS FOR EXPLORATION

Ordovician reservoirs are still the focus of exploration directed at discovery or development of oil reservoirs. Reservoirs located in near-shore locations on Crown land beneath Lake Erie have become very attractive targets in the past 2 years. Essex County and southern Kent County are still the most attractive onshore locations. Most of the wells drilled in this play utilize horizontal drilling technology.

There still remains considerable untested natural gas potential in Lake Erie and parts of the onshore portions of the Niagara peninsula. If natural gas prices remain high the economics of all the gas plays in Ontario are greatly enhanced, in particular the Lower Silurian sandstone plays both onshore and offshore, and the platform reef play offshore Lake Erie. There is potential for discovery of Cambrian gas or oil pools along the pinch-out edge of the Cambrian sandstone in the subsurface, or in fault-controlled structures. Silurian pinnacle and incipient reefs in Lambton County are also gas-prone and have the additional advantage of potential conversion to natural gas storage.

Table 1. Successful exploratory wells in southwestern Ontario, 2002. See Figure 1 for well locations.

Map #	Latitude	Longitude	Well Name	Target	Depth	Result	TD Date
1	42-37-25.947	80-40-53.421	Pifher 5 Houghton 3-2-I	CLI	445	GP-ACT	2002-11-05
2	42-38-34.708	80-40-49.343	Pifher 7 Houghton 3-5-I	CLI	424	GP-ACT	2002-12-12
3	42-38-55.398	80-40-47.883	Pifher 6 Houghton 3-6-I	CLI	445	GP-CAP	2002-12-06
4	42-41-30.110	80-42-49.06	Pifher 12 Houghton 6-11-WNR	CLI	417	GP-POT	2002-09-26

Map #	Latitude	Longitude	Well Name	Target	Depth	Result	TD Date
5	42-37-44.797	81-38-30.011	REC #11 Aldborough 1-21-IV	CLI	541	GP-ACT	2002-12-12
6	42-38-15.002	81-38-30.242	REC #14 Aldborough 5-22-III	CLI	544	GP-POT	2002-12-03
7	43-43-49.39	80-44-22.1	Echo 24 Bayham 6-24-SG	CLI	413	GP-CAP	2002-10-04
8	42-42-10.71	80-43-54.04	Echo 20 Bayham 6-26-V	CLI	414	GP-CAP	2002-11-05
9	42-43-18.23	80-47-14.63	Echo 22 Bayham 4-15-V	CLI	422.5	GP-POT	2002-11-05
10	42-42-4.53	80-46-15.43	Echo 18 Bayham 3-18-IV	CLI	423	GP-POT	2002-07-03
11	42-41-32.37	80-45-42.12	Echo 17 Bayham 6-20-IV	CLI	426	GP-POT	2002-09-26
12	42-43-2.25	80-45-3.66	Echo 21 Bayham 2-22-V	CLI	419.9	GP-POT	2002-07-02
13	42-41-22.33	80-44-31.01	Echo 16 Bayham 5-24-IV	CLI	418	GP-POT	2002-12-14
14	42-43-21.87	80-43-36.04	Echo 23 Bayham 8-27-SG	CLI	412	GP-POT	2002-07-02
15	42-42-2.88	80-43-19.81	Echo 19 Bayham 6-28-V	CLI	415	GP-POT	2002-12-16
16	41-59-32.83	82-31-17.902	TLM No.1 (Horiz #1) Mersea 2-18-D	ORD	2016	OP-ACT	2002-06-05
17	42-37-49.196	81-37-39.214	REC #13 Aldborough 6-23-IV	SAL	544	GP-POT	2002-03-19
18	42-44-8.784	82-27-4.538	Kinetic #5 Sombra 4-2-XIII	SAL	695	GP-POT	2002-10-25

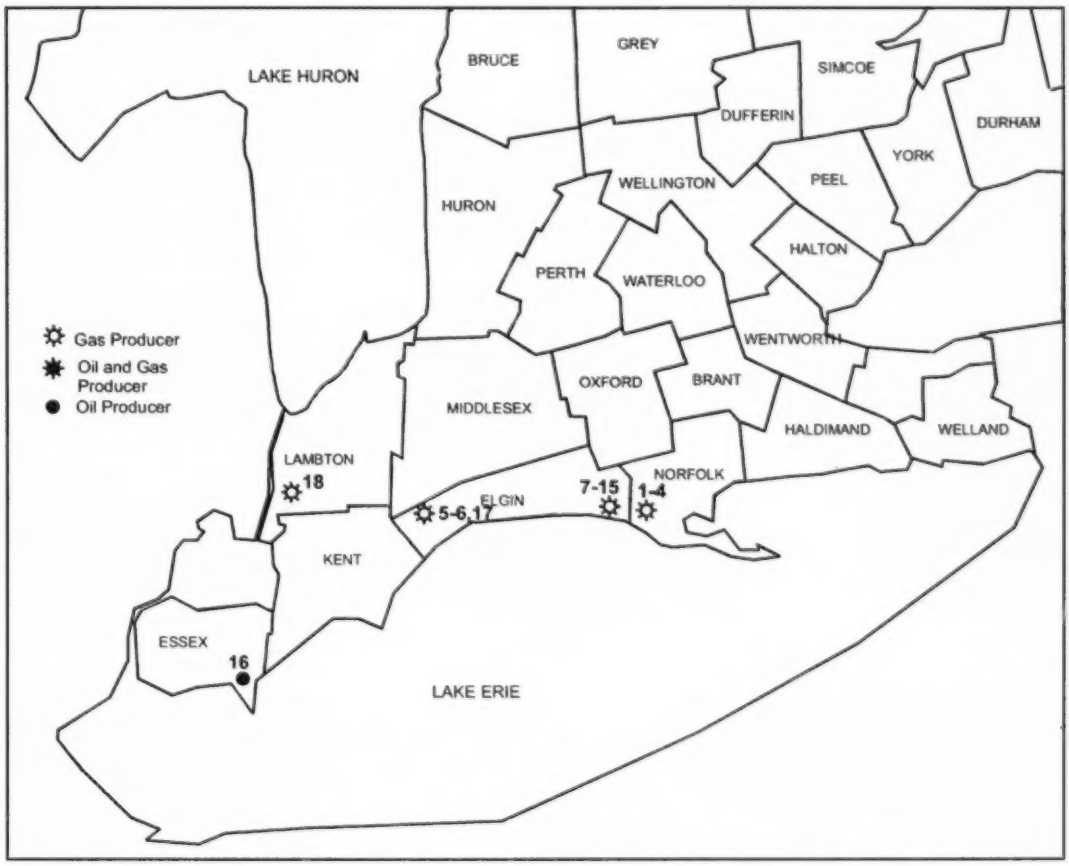

Figure 1. Successful exploratory wells in Ontario in 2002.

Metric Conversion Table

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
		LENGTH			
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
		AREA			
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
		VOLUME			
1 cm^3	0.061 023	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.307 951	cubic yards	1 cubic yard	0.764 554 86	m^3
		CAPACITY			
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
		MASS			
1 g	0.035 273 962	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 747	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 622 6	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311 3	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 90**	t
		CONCENTRATION			
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

	Multiplied by	
1 ounce (troy) per ton (short)	31.103 477	grams per ton (short)
1 gram per ton (short)	0.032 151	ounces (troy) per ton (short)
1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

Note: Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries, published by the Mining Association of Canada in co-operation with the Coal Association of Canada.

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